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STANDARDIZED WIND AND WAVE ENVIRONMENTS FOR NORTH PACIFIC OCEAN AREAS

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Bethesda, Maryland 20084



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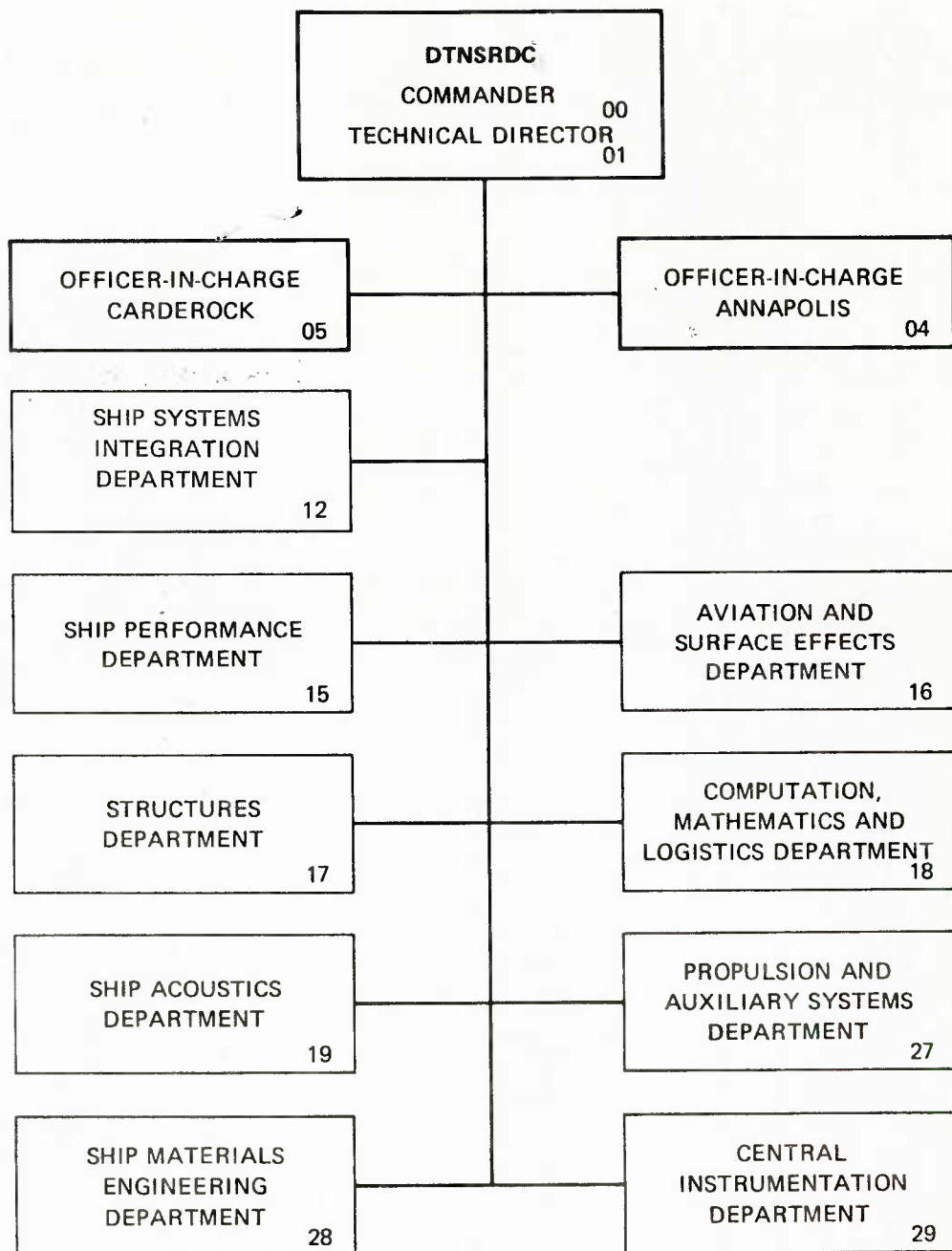


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ABSTRACT

This report is a source document for specifying wind and wave conditions for the North Pacific Ocean. The data are derived from the U.S. Navy's Spectral Ocean Wave Model (SOWM) hindcast wind and wave climatology. Some initial efforts by the Navy to synthesize the hindcasts into design tools are presented in this report.

The report provides seasonal and geographic distributions of wind and wave parameters and specifies mathematical models by which wave spectra, required by any ship seakeeping performance methodology, can be developed. Long-term extreme wave predictions for fatigue analysis are also discussed.

ADMINISTRATIVE INFORMATION

This report was prepared under the sponsorship of the Naval Sea Systems Command (NAVSEA), Code 63R-34 Surface Wave Spectra for Ship Design (SWSSD) Program under Program Element 62759N and Project Number SF 59 557 695. It is identified by Work Unit Numbers 1500-384 and 1500-385 at the David W. Taylor Naval Ship Research and Development Center (DTNSRDC).

INTRODUCTION

Until recently, the wind and wave environment has played a very minor role in the design and evaluation of ships and offshore platforms. The consideration of ship performance in the prevailing environment has focused primarily on optimization of calm water resistance and other factors related to the ship propulsion system. The effort to develop reliable open ocean wind and wave statistics was greatly advanced with the introduction of the Spectral Ocean Wave Model in 1975. Briefly, archived wind data are used by Fleet Numerical Oceanography Center (FNOC) to hindcast the resulting wave fields for approximately 1500 locations (grid points) throughout the Northern Hemisphere. The wind fields are updated at six hour intervals over a period of 17 years. Thus, the resulting wave directional spectra are really a hindcast time history of wave conditions throughout the Northern Hemisphere over a period of years. Some initial efforts by the Navy to synthesize the hindcasts into design tools are reported in References 1* to 6 and summarized in Reference 7. These reports generally develop techniques for parameterizing the spectra and developing joint frequencies of occurrence of

*A complete listing of references is given on page 13.

critical wave and wind parameters for a few particular locations. Additionally, the occurrence of extremes, the persistence of sea severity, and the characteristic spread and shape of spectral directionality are examined.

At present, design decisions may be biased by existing techniques which are essentially representative of only North Atlantic conditions. This report is intended to accelerate ongoing efforts to make the Navy North Pacific hindcast data available in a usable form to the entire naval engineering community.

OPEN OCEAN NORTH PACIFIC

The open ocean areas identified on Figure 1 span the North Pacific from the latitude of the Northeast Trade Winds (up to about 30° N) through those of the prevailing Westerlies ($30-50^{\circ}$ N) and into the Polar Easterlies (above 50° N). Additionally, the influence of land mass, currents, continental shelf, and local storm tracks each cause a different climatology variation with longitude. Table 1 identifies the location of the points currently included on Figure 1. The parameter sets that are developed are

- a. Significant wave height versus modal wave period
- b. Significant wave height versus wind speed at 19.5 meters
- c. Significant wave height versus primary wave direction
- d. Wind speed versus wind direction
- e. Significant wave height versus wind speed at 10 meters
- f. Significant wave height versus zero crossing period
- g. Significant wave height versus average mean period
- h. Modal wave period versus zero crossing period
- i. Modal wave period versus average mean period
- e. Persistence of wave height
- f. Persistence of wind speed at 19.5 meters

The data distributions are developed for the 17-year period from 1959 to 1975.

Appendix A provides the data base of open ocean wind and wave conditions derived from the 17-year hindcast wind and wave climatology. Wind and wave data tables are provided for areas identified in the North Pacific open ocean region. Both annual and seasonal distributions are provided. The seasons are defined by:

1. Winter - December to February
2. Spring - March to May

3. Summer - June to August

4. Fall - September to November

A few words are in order with regard to the quality of hindcast data. Since the SOWM hindcasts are based on the localized barometric pressures and resulting wind velocity fields, the wave observational biases of other wave models are excluded, see Reference 8. The SOWM is best used by statistically averaging wave conditions over a period of years for a specific location and season. The hindcasts generally provide greater occurrences of higher sea states and show less occurrences of lower sea states than visual observations. With regard to wave periods, the hindcasts generally indicate longer wave periods for given heights than for visual observations. This is not surprising as it is difficult to observe wave periods at sea and the codes used to record observed occurrences onboard ship are confusing to some observers. Very often the naval architect uses the most probable modal or peak wave period for several varying wave heights. In this work, the modal periods, being longer, will cause larger responses to be calculated for the longer ships. It is noted that the modal periods developed in this work are reflective of the peak of the entire (density) spectrum. Very often this coincides with the peak of the primary direction.

Figures 2 and 3 provide detailed comparisons of annual and winter season occurrences respectively for the locations defined in Table 1. These data are based on the occurrences provided in Appendix A. Generally, more severe conditions prevail between 50 and 60° N with the north-western region indicating slightly worse conditions. However, during the winter season the emphasis shifts slightly to the north-eastern longitudes. For the annual comparison of significant wave height occurrences for the grid points under consideration, the most consistently severe wave conditions occur in the north portion of the Pacific. Annual occurrence comparisons of modal wave periods and wind speeds for these same grid points also conform to the above specifications. Figure 4 provides comparisons of the annual and winter significant wave height exceedances for the North Pacific and the North Atlantic oceans. In general, annual data compares well for both oceans but winter data does not.

WAVE SPECTRAL FAMILIES

BRETSCHNEIDER

In keeping with the recommendations of the International Ship Structures Congress (ISSC) and the International Towing Tank Conference (ITTC), as well as current U.S. Navy design practice, the two-parameter Bretschneider spectral formulation is recommended for use for the open ocean areas. Bretschneider spectra represent the less common fully developed as well as the usual partially developed seas that persist most of the time throughout the world oceans. The spectral density can be written in the form

$$S(\omega) = A \omega^{-5} \exp\left[-\frac{B}{\omega^4}\right] \quad \text{m}^2 \cdot \text{sec} \quad (1)$$

$$\text{where } A = \frac{483.5 (\tilde{\zeta}_w)_{1/3}^2}{T_o^4} \quad \text{m}^2 \cdot \text{sec}^{-4} \quad (2)$$

$$\text{and } B = \frac{1944.5}{T_o^4} \quad \text{sec}^{-4} \quad (3)$$

where the two defining parameters of the spectrum are the significant wave height (average of one-third highest double amplitudes), $(\tilde{\zeta}_w)_{1/3}$, in meters and the modal wave period (peak of the wave spectrum), T_o , in seconds. The parameters can be taken from the data base provided in Appendix A, see Appendix B for data format description. As indicated in Appendix A, the frequency distribution, being fixed in SOWM, permits only certain modal period values in the parameterization of the spectra.

MODIFIED JONSWAP

When the ocean areas are relatively shallow, and at least partially surrounded by land, the Bretschneider spectral formulation is not recommended for use. Instead, the mean Modified JONSWAP spectrum is recommended. This formulation was developed by Hasselmann in order to model fetch-limited, shallow water wave conditions, see Reference 9.

The resulting function is a generalization of the Pierson-Moskowitz form by inclusion of fetch as an additional parameter to wind speed. As it is usually

written, the mean JONSWAP spectrum is dependent on the two parameters wind speed and fetch. However, for simplicity as well as consistency with the current state-of-the-art in seakeeping performance assessment, a JONSWAP expression which is dependent only on the two parameters, significant wave height and modal wave period, is desirable. Such an expression is derived in References 10 and 11 and written in the form

$$S(\omega) = B g^2 \omega^{-5} \exp \left[-1.25 \left(\frac{\omega T_0}{2\pi} \right)^{-4} \right] \gamma \exp \left[-\frac{1}{2\sigma^2} \left(\frac{\omega T_0}{2\pi} - 1 \right)^2 \right] \quad \text{m}^2 \cdot \text{sec} \quad (4)$$

$$\text{where } \sigma = 0.07 \text{ for } \frac{\omega}{2\pi} \leq \frac{1}{T_0} \quad (5)$$

$$\sigma = 0.09 \text{ for } \frac{\omega}{2\pi} > \frac{1}{T_0}$$

$$B = \frac{319.43 (\zeta_w)_{1/3}^2}{g^2 T_0^4} \quad (6)$$

$\gamma = 3.3$ for the mean JONSWAP spectra

If $\gamma = 1$ and $B = 0.0081$, the JONSWAP spectrum will reduce exactly to the Pierson-Moskowitz spectrum.

As with the usual JONSWAP formulation, the modified expression given in Equation (4) is for long-crested seas. While there is limited experimental verification, the cosine squared spreading function is recommended for use with the JONSWAP spectral formulation at this time.

SPECTRAL MOMENTS

Due to the randomness of ocean waves, two records measured at different times having the same height and period generally would not have the same spectrum. For the spectrum to remain the same, all moments must also remain the same. The various moments of the spectrum are defined as

$$m_n = \int_0^{\infty} S(\omega) \omega^n d\omega \quad (7)$$

The following are the most commonly used expressions using various combinations of the moments in describing wave spectra, see Reference 12.

$$\text{Significant Wave Height } (\tilde{z}_w)_{1/3} = 4\sqrt{m_0}$$

$$\text{Average Mean Period} \quad T_1 = \frac{2\pi m_0}{m_1}$$

$$\text{Energy Average Period} \quad T_{-1} = \frac{2\pi m_{-1}}{m_0}$$

$$\text{Average Zero Crossing Period } T_2 = 2\pi \left(\frac{m_0}{m_2} \right)^{1/2}$$

COSINE-SQUARED SPREADING FUNCTION

Since ocean waves are usually multi-directional, a cosine-squared spreading function is recommended to represent wave directionality. The function can be written as

$$S(\omega, \nu) = \frac{2}{\pi} \cos^2 (\nu - \mu) S(\omega) \quad (8)$$

$$= W \cdot S(\omega) \quad (9)$$

where ν represents the secondary wave directions, μ is the predominant wave direction, and $S(\omega)$ is the point wave spectrum, see Reference 13. In applying Equation (8), it is assumed that energy is constant across direction bands equivalent to the increment across successive ν 's, and that it is constant for all wave frequencies. The spreading function is generally applied to ± 90 degrees and at 15-degree increments from the predominant wave direction for the wind-wave spectrum. Table 2 provides the weights, W , that can be applied to achieve spreading of the spectral components.

SPECTRAL PARAMETERIZATION

With regard to the estimation of the long-term wave data for design purposes, two factors which may seriously affect the magnitude of predicted values have to be taken into consideration. These include the sea severities and sample size. Calculations of extreme waves and ship response for long-term predictions and fatigue analysis are also discussed in this section.

LONG-TERM WAVE HEIGHT EXCEEDANCES

Long-term prediction provides valuable wave data to evaluate the extreme ship motion response expected to occur in the lifetime of a marine vehicle. It may also be used to evaluate the possible fatigue failure due to repeated loadings.

In connection with extreme load analysis, the 100 year return period of significant wave height is generally used. For fatigue analysis, a return period is normally 10 years. In general, the 1-year return period is taken as the basis for accidental loads or damage analysis, see Reference 14.

Figure 5 provides the combined annual significant wave height by return period for different ocean areas of the world. The maximum wave height corresponding to a specific return period may be obtained from this wave exceedance graph. This facilitates selecting a reasonable maximum design value and also helps in making fatigue calculations.

EXTREME VALUE

The most probable extreme value of a random process can be calculated by applying order statistics and the Weibull probability distribution to the wave data, see Reference 15. Then, the largest value in the ordered sample, k_n , with a return period factor R can be expressed as

$$k_n = \theta (\ln RN)^{1/B} \quad (10)$$

B is the Weibull slope known as the slope factor and θ is the scale parameter or characteristic value. B is dimensionless and θ has the same units as k_n . N is the sample size. The return period factor R , defined as the average waiting time between exceedances of the extreme value, is used as a safety factor to minimize the probability that the extreme value will exceed the predicted extreme value. For example, when R is equal to 100, the probability that the

predicted extreme value will be exceeded is 0.01, see Reference 15. If the samples are sufficiently large, derivation of the Weibull parameters based on the mean and the variance of the data set are simple to accomplish and can provide an objective estimate of the parameters. The procedure for this method is as follows. The mean value for the Weibull distribution can be defined as

$$\bar{X} = \theta \Gamma \left(1 + \frac{1}{B} \right) \quad (11)$$

where Γ is the gamma function and X is the mean value. The sample variance S^2 is given as

$$S^2 = \theta^2 \left[\Gamma \left(\frac{2}{B} + 1 \right) - \Gamma^2 \left(\frac{1}{B} + 1 \right) \right] \quad (12)$$

Dividing S^2 by \bar{X}^2 yields

$$\frac{S^2}{\bar{X}^2} = \frac{\Gamma \left(\frac{2}{B} + 1 \right)}{\Gamma^2 \left(1 + \frac{1}{B} \right)} - 1 \quad (13)$$

Table 3 lists S^2/\bar{X}^2 values as a function of B and can be used to obtain the value of B by interpolation.

Table 4 shows a comparison of actual and predicted extreme wave heights for various ocean areas over a 10 year period ($R = 1$). Also included in the table are the predicted extreme values for $R = 10, 25, 50$ and 100 . When the sample size is very large, i.e., North Pacific Ocean in Table 4, the agreement between the predicted and observed extreme values is within 2 percent. On the other hand, for a smaller sample size, such as Station India, the difference between the predicted and actual extreme value for $R = 1$ is about 9 percent.

STRATIFIED SAMPLE

Unpublished work by Cummins at DTNSRDC defines a family of "stratified" directional wave spectra for the period 1959-69 that has been developed for the North Atlantic. The primary stratification is with regard to significant wave height variations and the secondary is with regard to geographic location.

Seasonal variations are also included in the resulting approximately 2000 spectra. The wave height strata are 0 to 1, 1 to 2, 2 to 3, 3 to 5, 5 to 8, and greater than 8 meters. The Stratified Sample has no bias due to the fixed family shape of the commonly applied idealized spectra. It provides an unbiased sample of directional spectra representative of all sea severities and North Atlantic Ocean areas. An analogous data set is being constructed for the North Pacific.

WIND AND WAVE MODEL

As wind data are generally available for many open and coastal ocean areas, the following method is developed in Reference 16 for deriving the probability distributions of significant wave height or modal wave period from wind speed statistics. The procedure depends on the application of a two-parameter Weibull distribution. In brief, given a wind speed distribution from any data source, a corresponding significant wave height distribution or a modal wave period distribution can be developed. The procedure of this model is summarized by the following steps.

1. Using the appropriate a , b , c , and d values from Table 5 for Equations (14) and (15), determine B and θ values for various wind speed intervals.

$$B = a_B + b_B W + c_B W^2 + d_B W^3 \quad (14)$$

$$\theta = a_\theta + b_\theta W + c_\theta W^2 + d_\theta W^3 \quad (15)$$

where B is the Weibull slope known as the shape factor. θ is called the scale parameter or characteristic value. B is dimensionless and θ has the same units as X in Equation (16).

2. Substituting the appropriate sets of B and θ values into the following equation

$$f(X|B, \theta) = \frac{B}{\theta} \left(\frac{X}{\theta}\right)^{B-1} \exp\left[-\left(\frac{X}{\theta}\right)^B\right] \quad (16)$$

to derive the significant wave height frequency of occurrence distributions for different wind speeds. For best results the values for X as listed in Table 6 are recommended. These correspond to the interval mid-points of the data provided in Appendix A.

3. Then, using the existing wind speed percentage distributions and substituting into the equation as follows:

$$f(X_j) = \sum_i [f(X_j | B_i, \theta_i) \cdot f(W_i)] \quad (17)$$

$f(X_j | B_i, \theta_i)$ is a conditional probability density function of significant wave height or modal wave period for given wind speed. B_i and θ_i are functions of wind speed. Where $f(W_i)$ is the probability of wind speed derived from available wind speed occurrences, X_j is the significant wave height in meters or the modal wave period in seconds.

PRACTICAL APPLICATIONS

The recommended use of this wind and wave data is by utilizing a probabilistic approach to identifying the encountered environment of a maritime or naval mission. Many ocean activities can benefit through ascertaining and understanding the geographic and time (season, annual) specific environmental conditions which are to be expected. Conversely, one can use the data to select a time and area with the best likelihood of encountering a specified environmental condition. Ocean activities which may be enhanced or in which the safety of operation may be enhanced include: ship design, ship performance assessment, sea trials, naval warfare missions, offensive and defensive mining, amphibious operations, and salvage/rescue activities. Each activity would utilize the atlas in the same rudimentary fashion but with activity-specific algorithms to find the best forecast based on climatology.

I. Naval ship designers can follow four steps when applying wind and wave climatologies, as contained in this atlas toward improving the fleet.

a. Thoroughly define the mission of the ship and the limiting environmental factors, in which the mission must be performed, at specified levels of efficiency.

b. Identify the area(s) of operation.

c. Extract the percent of occurrence of the limiting environmental factors from the appropriate time and area specific table. This can be done either seasonally or annually.

d. To calculate ship response, derive the percent of time of successful, limited, and unsuccessful mission operation by using the percent frequencies of

occurrence of the environmental parameters. If the resultant percentages are not acceptable, the designer must fine tune the ship's hull configuration to meet the desired operating envelope.

II. Wind and wave data can be used to assess how the environment may have been a contributing factor in the failure or damage of a system, operation, or equipment. Failure in this context refers to losses which result from fatigue over a significant portion of the ship's lifespan and not to a specific single environmental episode.

a. Identify the area(s) and season of operation prior to the "failure" of interest.

b. Identify the environmental conditions which, if exceeded (modal wave period, significant wave height, wind speed), would probably cause the damage or failure.

c. Derive the percent of occurrence of conditions exceeding those conditions of step b above, for the operational areas and time.

III. Sea trial and naval warfare planning can be enhanced through the use of this atlas by following a procedure of identifying areas of the ocean most likely to provoke the desired seaway and resulting ship motions for a given time of year.

a. The first step is to define the seaway (upper and lower wave height limits) best suited for specific tasks of the sea trial or mission.

b. Identify the general geographic area of interest.

c. From the climatology, identify the time (season) which has acceptable probabilities of occurrence (e.g., 50 percent, 75 percent, 80 percent, etc.) of encountering the desired wave heights. Probabilities of occurrence can be extracted by area and time directly from Appendix A.

The basic underlying factor of each of the above uses is that one can obtain a good understanding of the general environmental conditions for a given time and location prior to the commencement of an activity or mission at sea. Armed with this knowledge one can have onboard contingency plans which will likely reduce mission reaction time in the event of encountering severe weather conditions as well as maximize mission effectiveness in all non-threatening environmental conditions.

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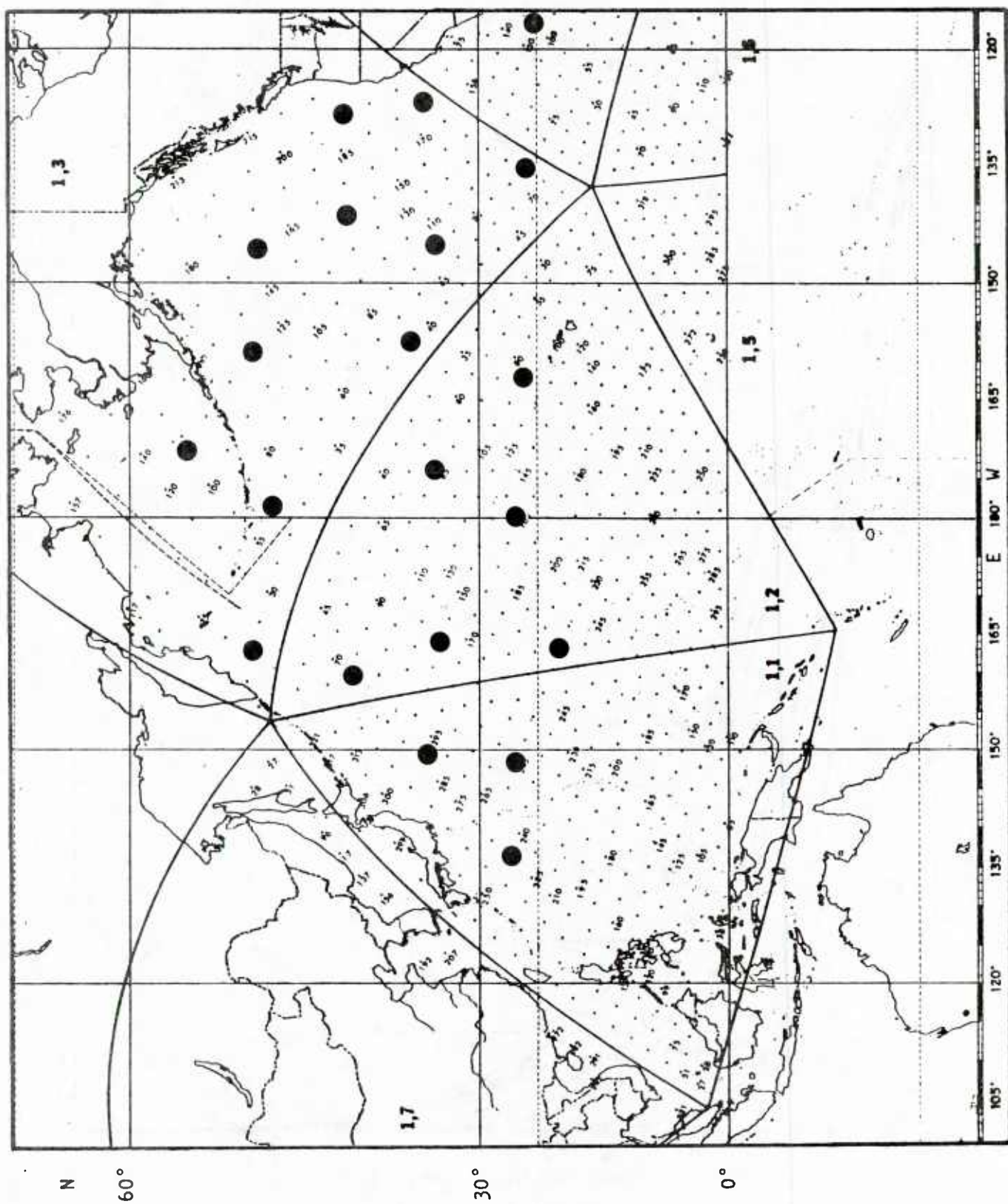


Figure 1 - Definition of Representative Areas in the North Pacific Basin

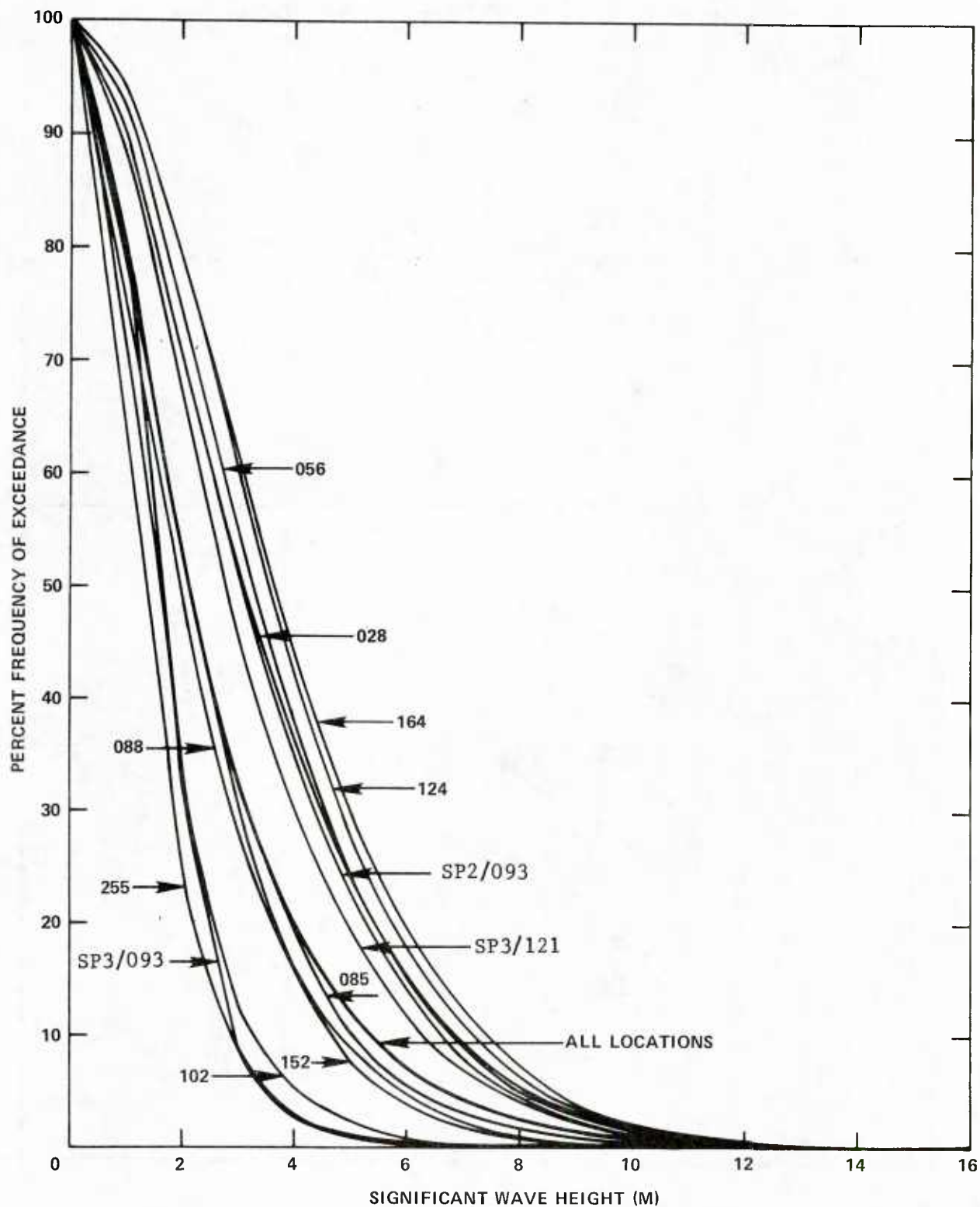


Figure 2 - Comparison of Annual Wave Height Exceedances of Representative Areas

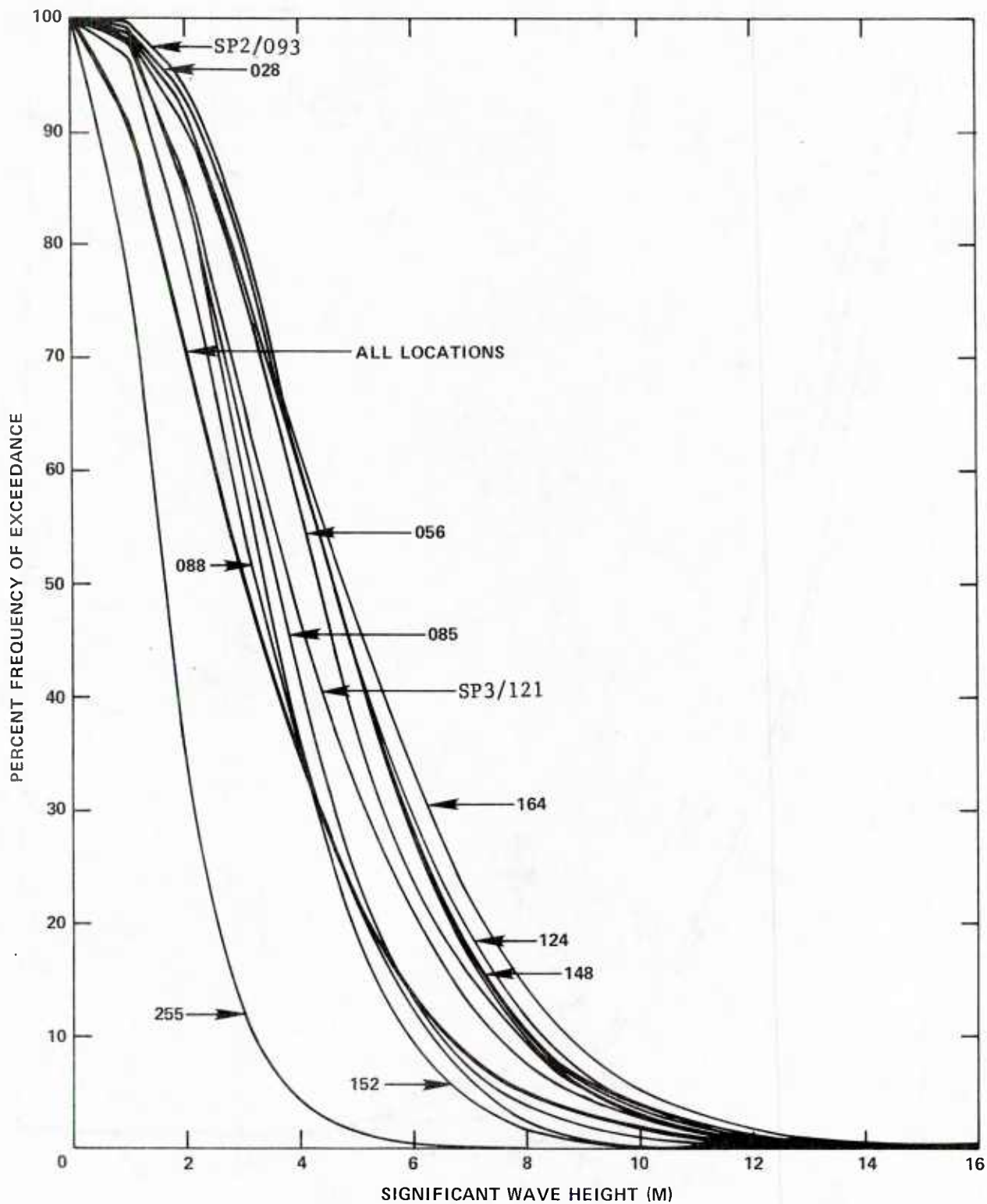


Figure 3 - Comparison of Winter Season Wave Height Exceedances of Representative Areas

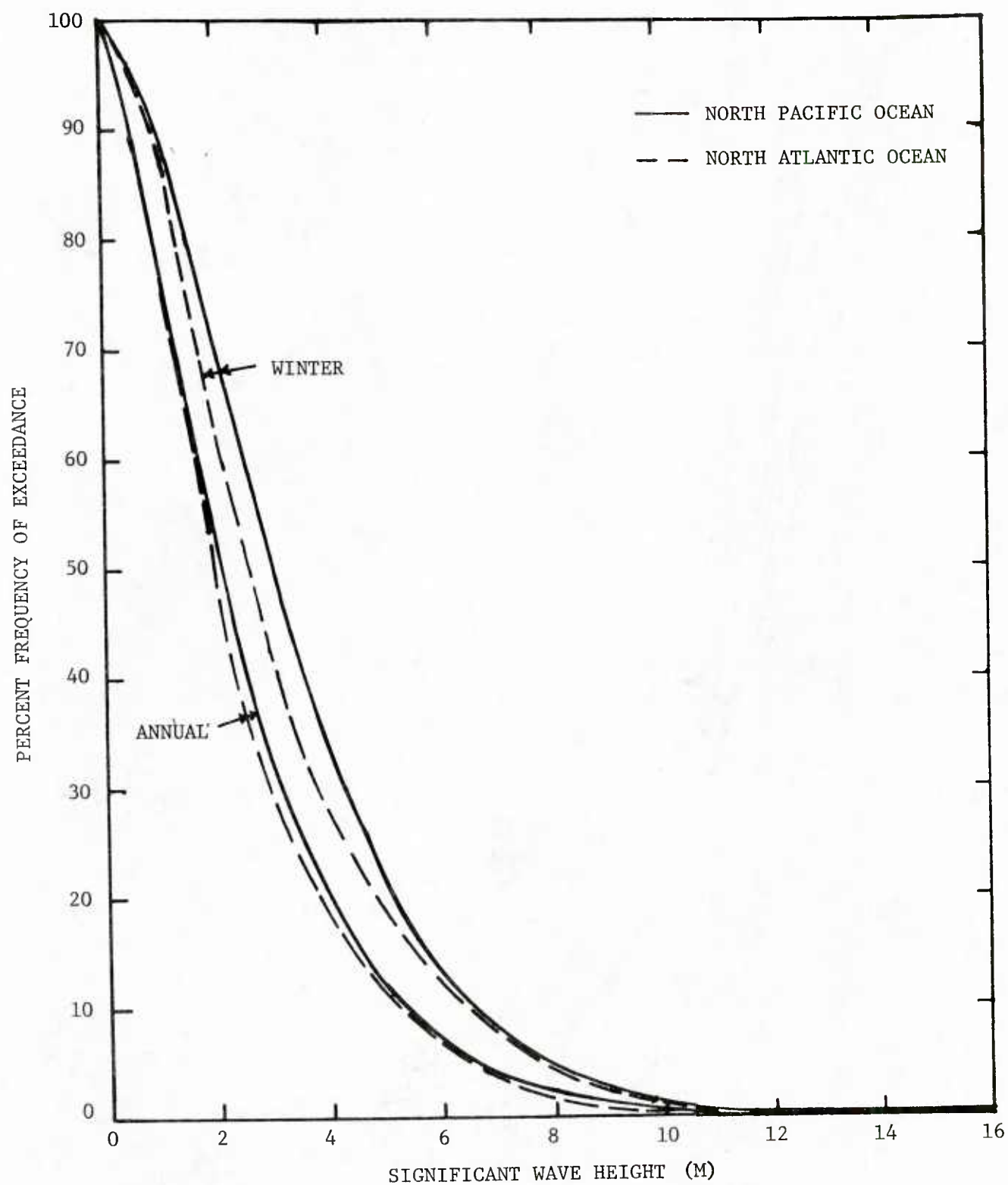


Figure 4 - Comparisons of Annual and Winter Wave Height Exceedances for the North Pacific and the North Atlantic Oceans

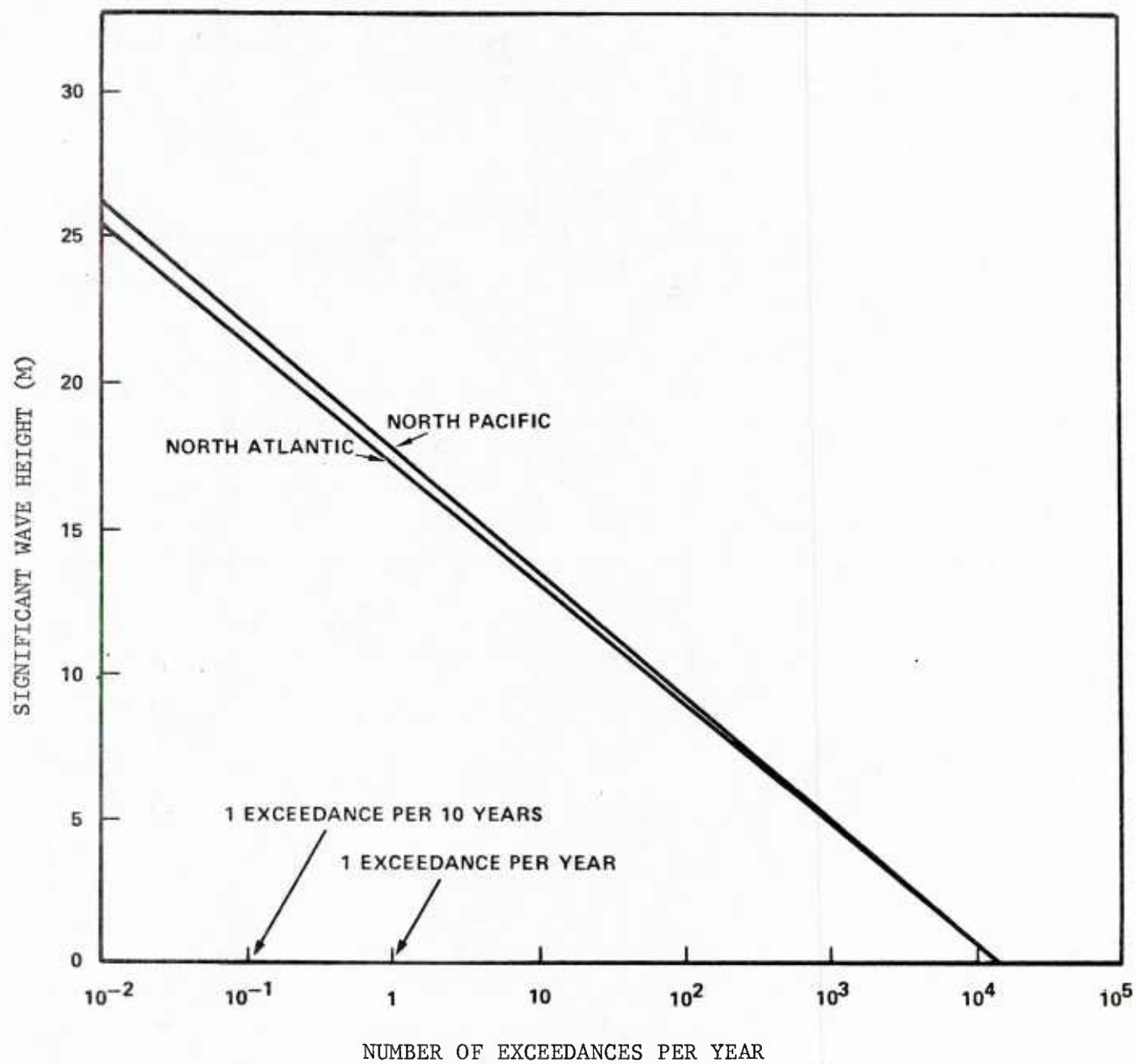


Figure 5 - Significant Wave Height Exceedance Diagram
(Figure 3 of Reference 16)

TABLE 1 - LOCATIONS DEFINING NORTH PACIFIC OCEAN AREAS

Subprojection	Grid Point	Latitude, N,	Longitude, W
1	255	26.0°	148.2°E
	239	26.5°	135.8°E
	294	36.3°	148.5°E
2	233	20.6°	163.1°E
	102	24.8°	162.5°
	165	25.2°	179.8°E
	152	34.2°	163.8°E
	85	34.5°	174.2°
	93	42.8°	159.0°E
3	93	24.6°	135.6°
	88	34.9°	145.6°
	188	36.2°	127.4°
	39	37.5°	158.0°
	148	43.2°	141.4°
	202	43.7°	128.7°
	56	50.0°	178.9°
	164	50.9°	145.6°
	124	51.3°	158.8°
	28	51.3°	162.5°E
	121	56.4°	171.7°
4	121	24.2°	116.3°

TABLE 2 - RECOMMENDED COSINE-SQUARED SPREADING WEIGHTS
(TABLE 2 OF REFERENCE 13)

W	ν^*	90°	75°	60°	45°	30°	15°	0°
Wave Angles, ν	-90°	0.000	--	--	--	--	--	--
	-75°	0.011	0.000	--	--	--	--	--
	-60°	0.042	0.019	0.000	--	--	--	--
	-45°	0.083	0.069	0.037	0.000	--	--	--
	-30°	0.125	0.131	0.125	0.083	0.000	--	--
	-15°	0.156	0.181	0.213	0.250	0.250	0.000	0.000
	0° (μ)	0.167	0.200	0.250	0.333	0.500	1.000	1.000
	15°	0.156	0.181	0.213	0.250	0.250	0.000	0.000
	30°	0.125	0.131	0.125	0.083	0.000	--	--
	45°	0.083	0.069	0.037	0.000	--	--	--
	60°	0.042	0.019	0.000	--	--	--	--
	75°	0.011	0.000	--	--	--	--	--
	90°	0.000	--	--	--	--	--	--

TABLE 3 - $\frac{S^2}{\bar{X}^2}$ VALUES AS A FUNCTION OF B
(TABLE V OF REFERENCE 15)

B	S^2/\bar{X}^2	B	S^2/\bar{X}^2	B	S^2/\bar{X}^2
0.5	5.0	1.9	0.300	3.3	0.111
0.55	3.861	1.95	0.286	3.35	0.108
0.6	3.091	2.0	0.275	3.4	0.106
0.65	2.543	2.05	0.261	3.45	0.103
0.7	2.139	2.1	0.25	3.5	0.1
0.75	1.83	2.15	0.24	3.55	0.098
0.8	1.589	2.2	0.23	3.6	0.095
0.85	1.396	2.25	0.221	3.65	0.093
0.9	1.239	2.3	0.213	3.7	0.091
0.95	1.109	2.35	0.205	3.75	0.088
1.00	1.00	2.4	0.197	3.8	0.086
1.05	0.908	2.45	0.19	3.85	0.084
1.1	0.828	2.5	0.183	3.9	0.082
1.15	0.760	2.55	0.177	3.95	0.081
1.2	0.700	2.6	0.171	4.0	0.079
1.25	0.648	2.65	0.165	4.05	0.077
1.3	0.602	2.7	0.16	4.1	0.075
1.35	0.561	2.75	0.154	4.15	0.074
1.4	0.524	2.8	0.149	4.2	0.072
1.45	0.491	2.85	0.145	4.25	0.071
1.5	0.461	2.9	0.14	4.3	0.069
1.55	0.434	2.95	0.136	4.35	0.068
1.6	0.409	3.0	0.132	4.4	0.066
1.65	0.387	3.05	0.128	4.45	0.065
1.70	0.367	3.1	0.125	4.5	0.064
1.75	0.348	3.15	0.121	5.0	0.053
1.80	0.330	3.2	0.118	5.5	0.044
1.85	0.314	3.25	0.114	6.0	0.041

TABLE 4 - COMPARISON OF CALCULATED AND MEASURED EXTREME WAVE HEIGHTS
(TABLE VII OF REFERENCE 15)

10 YEAR HINDCASTS	\bar{X}, M	S^2, M^2	N	B	θ	ACTUAL EXTREME VALUE, M	PREDICTED EXTREME VALUE, k_n, M				
							R = 1	R = 10	R = 25	R = 50	R = 100
N. PACIFIC	2.9	4.65	175588	1.36	3.17	19.5	19.8	22.4	23.2	24.3	25.0
N. ATLANTIC	2.6	4.11	133088	1.29	2.81	19.5	19.0	21.8	22.9	23.7	24.5
STATION INDIA (58.9°N, 18.3°W)	3.25	4.90	13303	1.50	3.60	17.8	16.1	18.6	19.6	20.3	21.0
STATION PAPA (50.9°N, 145.6°W)	3.69	5.53	13575	1.60	4.12	18.1	16.8	19.2	20.2	20.8	21.5

TABLE 5 - COEFFICIENT TO CALCULATE THE B AND θ VALUES FOR OPEN OCEAN AND COASTAL AREAS
(TABLE D-1 OF REFERENCE 16)

	SIGNIFICANT WAVE HEIGHT				MODAL WAVE PERIOD			
	ANNUAL		WINTER		ANNUAL		WINTER	
	B	θ	B	θ	B	θ	B	θ
a	1.118	1.09	1.072	2.1355	3.581	11.934	3.995	13.44
b	-0.0066	-0.0226	0.121	-0.0457	-0.0309	-0.1074	0.1015	-0.0225
c	0.00276	0.00954	-0.008	0.0095	0.000715	0.00865	-0.00323	-0.0000265
d	0.0000067	-0.00011	0.00022	-0.00011	0.000065	-0.000092	0.000057	0.000056

	SIGNIFICANT WAVE HEIGHT				MODAL WAVE PERIOD			
	ANNUAL		WINTER		ANNUAL		WINTER	
	B	θ	B	θ	B	θ	B	θ
a	0.6617	0.7472	0.7523	0.6889	3.11	12.132	4.666	13.68
b	0.0779	-0.0183	0.08035	0.0456	-0.1056	-0.2313	-0.1897	-0.139
c	0.000936	0.0071	0.000877	0.00355	0.0093	0.0096	0.010556	0.00178
d	-0.0000215	-0.000078	-0.0000245	-0.0000228	-0.00011	-0.000072	-0.000121	0.0000426

TABLE 6 - RECOMMENDED VALUES FOR CLASS INTERVALS X
(TABLE D-2 OF REFERENCE 16)

SIGNIFICANT WAVE HEIGHT, M	MODAL WAVE PERIOD SEC
0.5	3.2
1.5	4.8
2.5	6.3
3.5	7.5
4.5	8.8
5.5	9.7
6.5	10.9
7.5	12.4
8.5	13.8
9.5	15.0
11.0	16.4
13.0	18.0
15.0	20.0
18.0	22.5
22.0	25.7
26.0	
30.0	

APPENDIX A

SEASONAL CLIMATOLOGY OF THE NORTH PACIFIC OCEAN

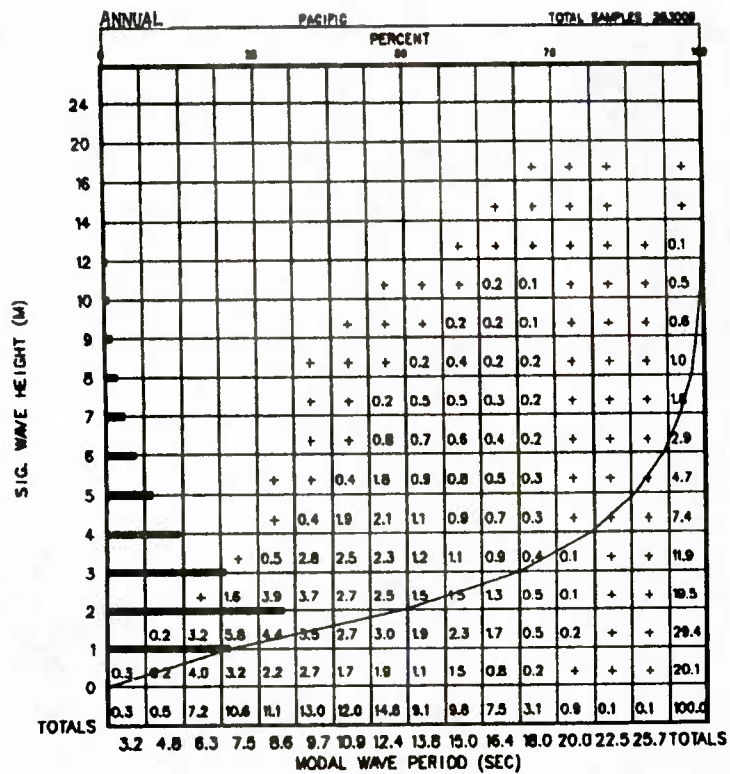


Figure A-Pac-1-1 Significant Wave Height vs. Modal Wave Period

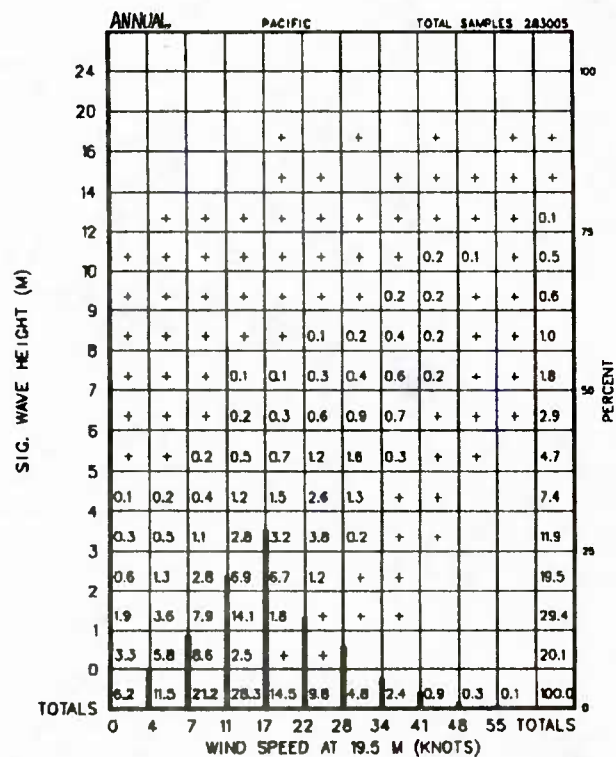


Figure A-Pac-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

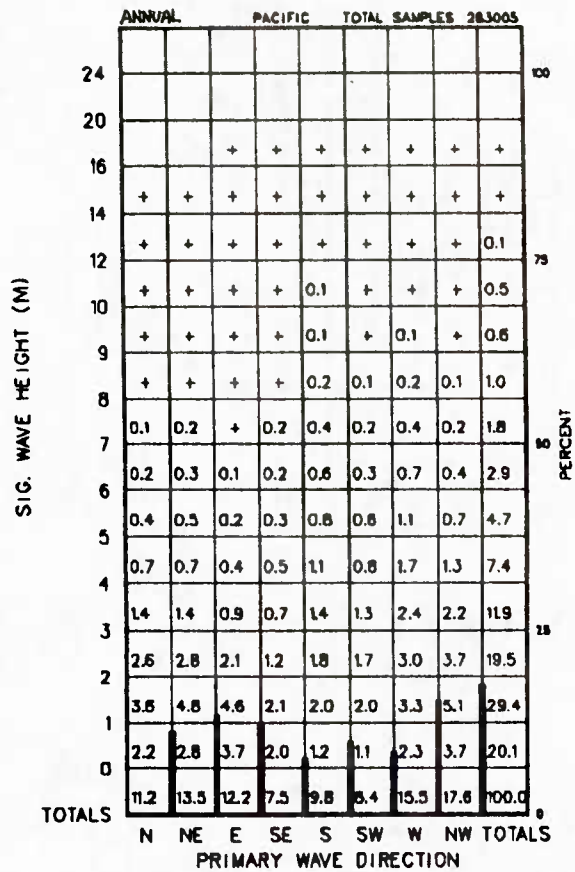


Figure A-Pac-1-3 Significant Wave Height vs. Primary Wave Direction

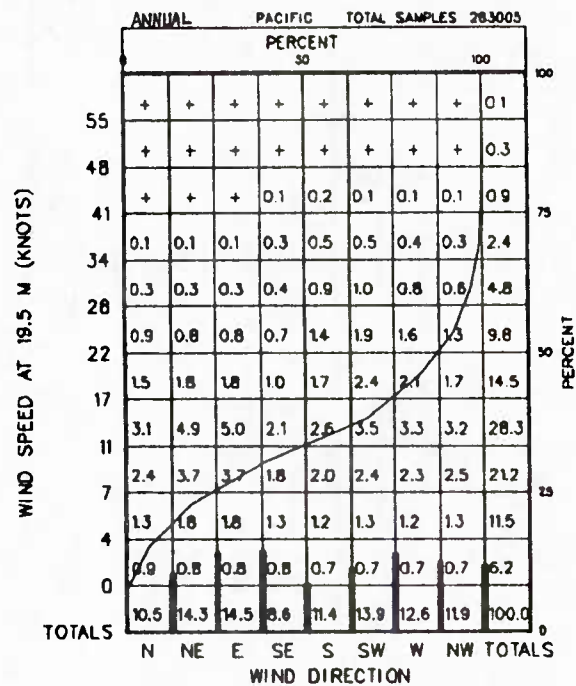


Figure A-Pac-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

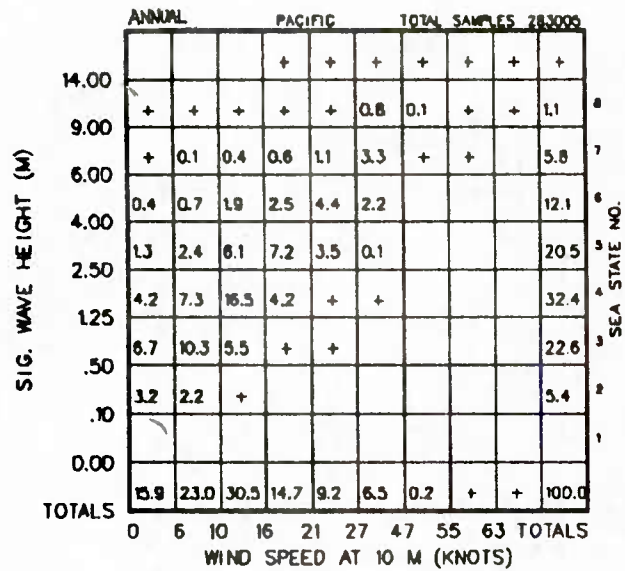


Figure A-Pac-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

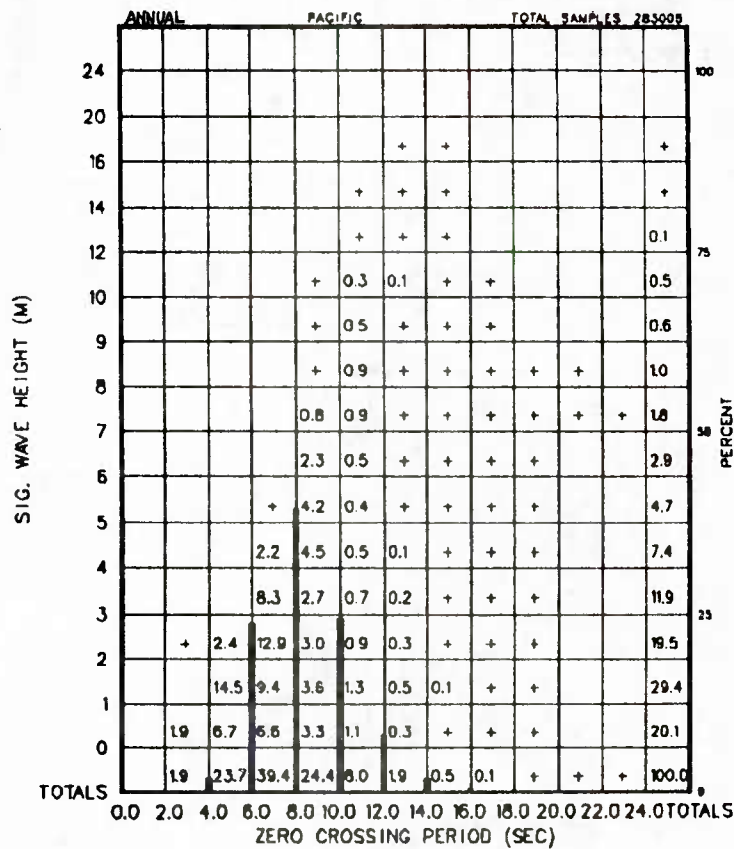


Figure A-Pac-1-6 Significant Wave Height vs. Zero Crossing Period

Figure A-Pac-1-9 Average Wave Period vs.
Modal Wave Period

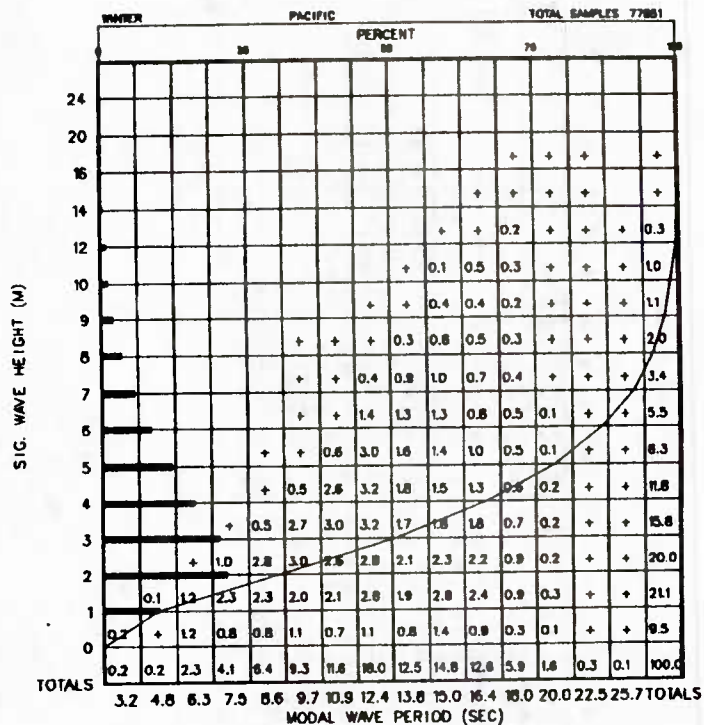


Figure A-Pac-2-1 Significant Wave Height vs. Modal Wave Period

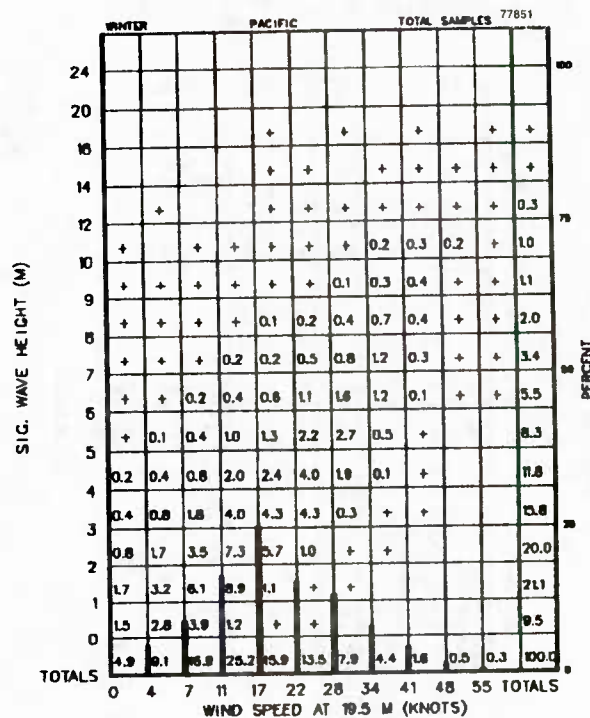


Figure A-Pac-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

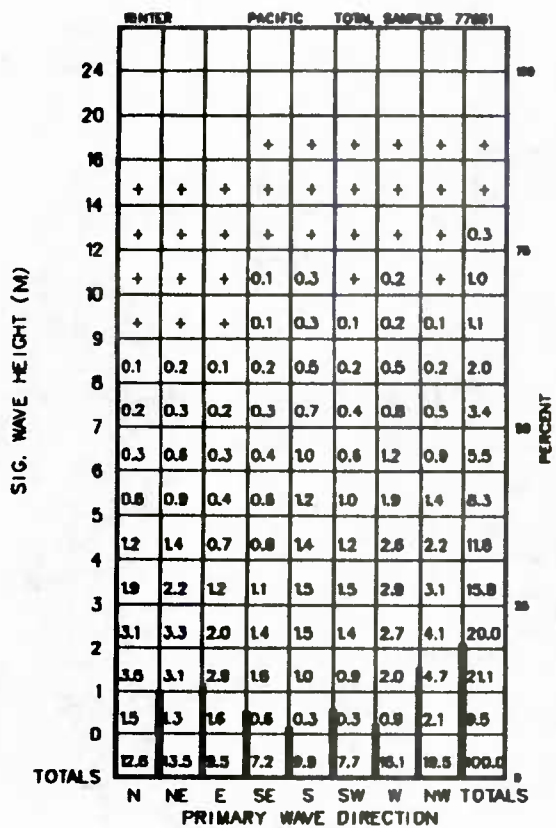


Figure A-Pac-2-3 Significant Wave Height vs. Primary Wave Direction

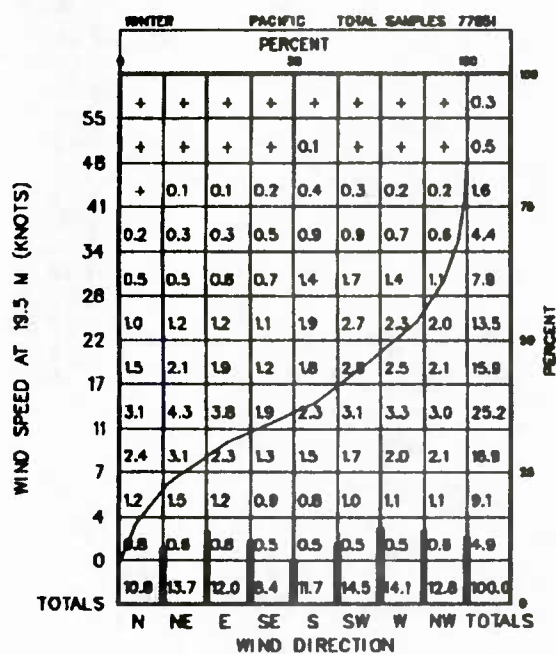


Figure A-Pac-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

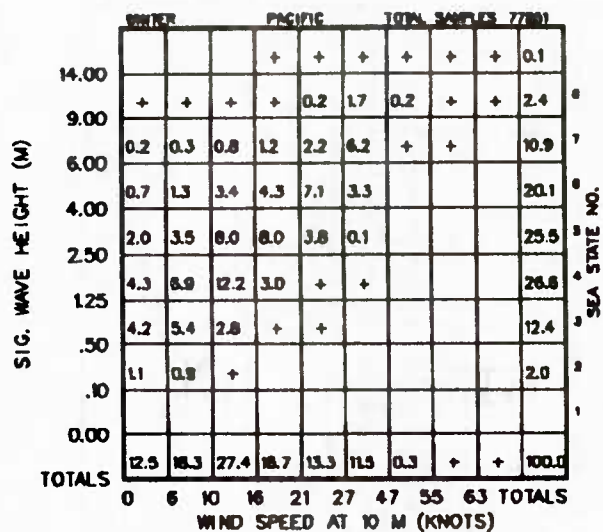


Figure A-Pac-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

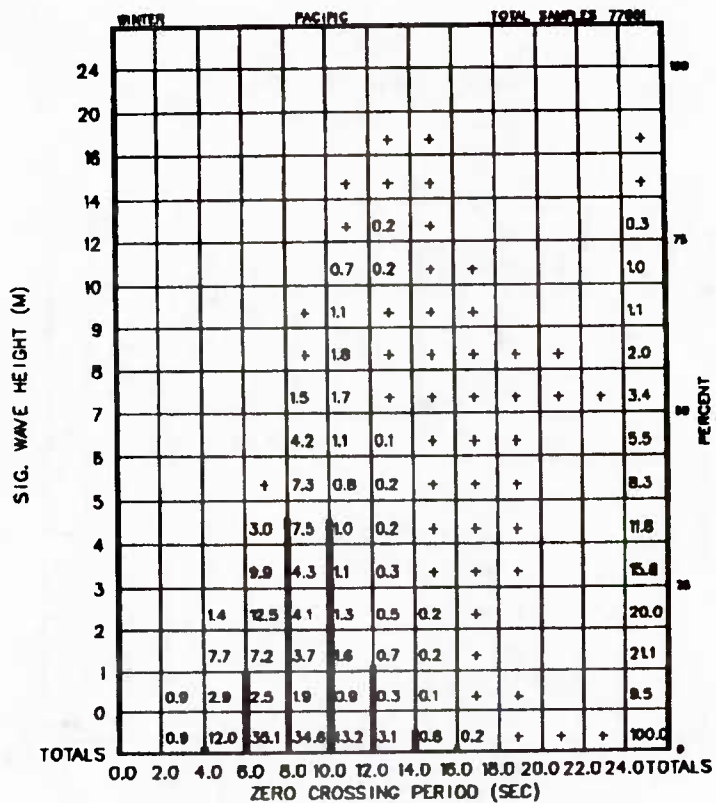


Figure A-Pac-2-6 Significant Wave Height vs. Zero Crossing Period

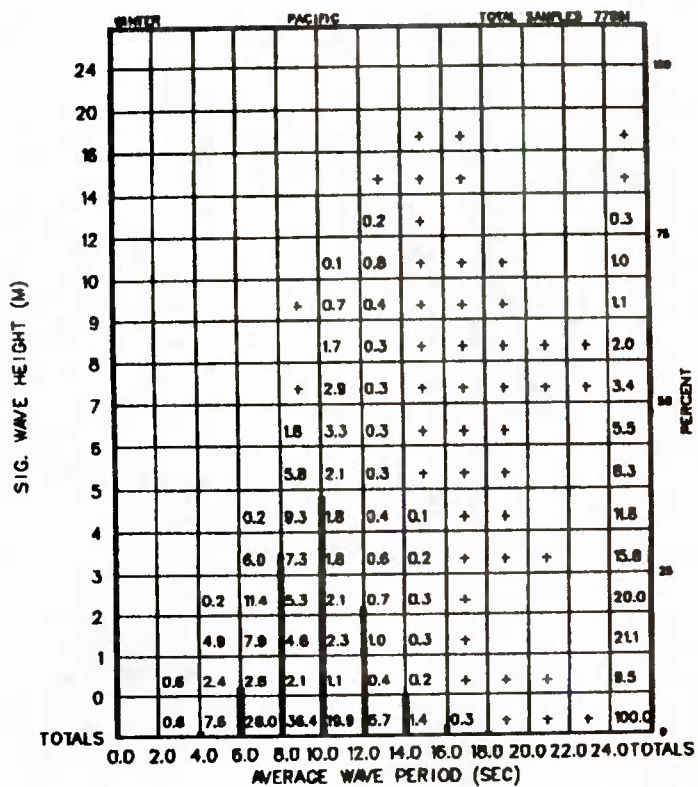


Figure A-Pac-2-7 Significant Wave Height vs. Average Wave Period

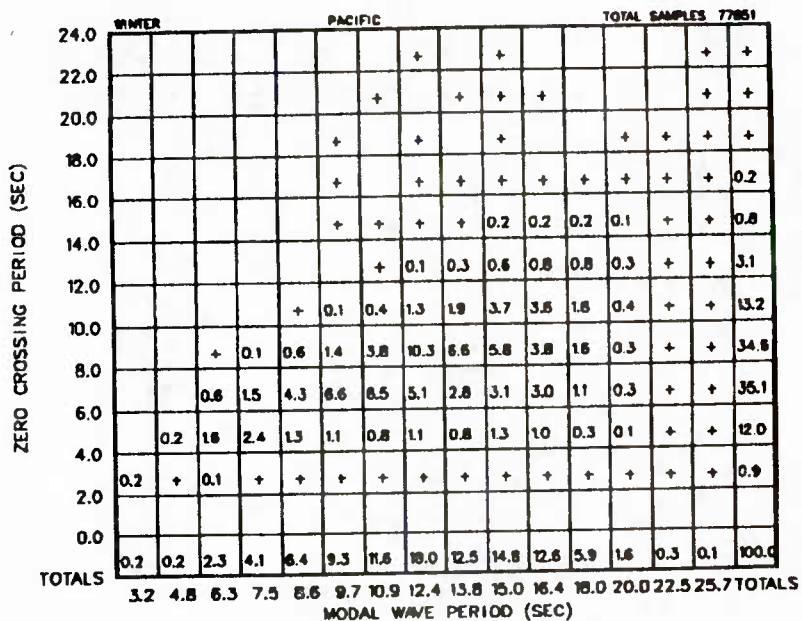


Figure A-Pac-2-8 Zero Crossing Period vs. Modal Wave Period

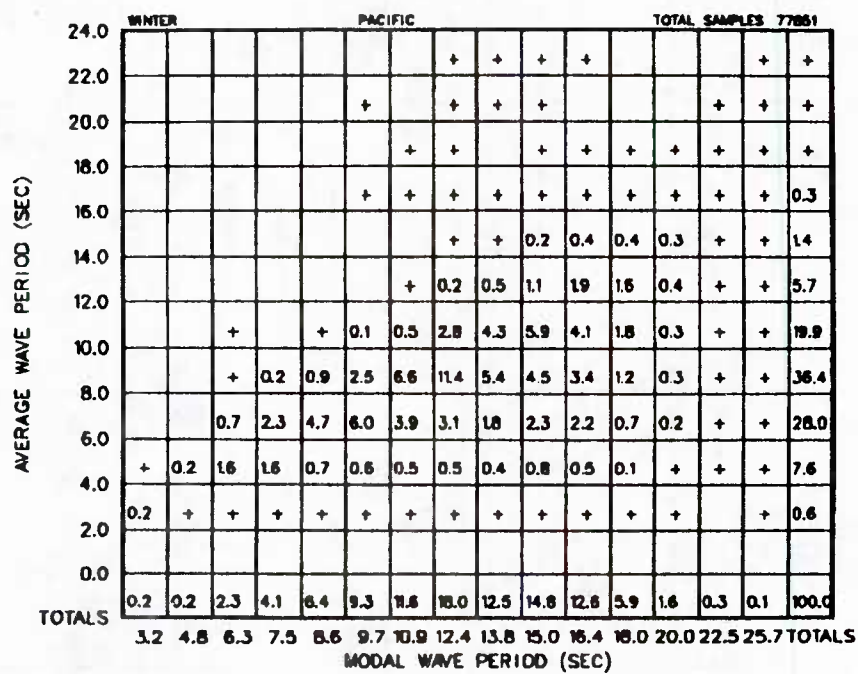


Figure A-Pac-2-9 Average Wave Period vs.
Modal Wave Period

TABLE A-239-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 26.51°, 135.84°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.25 9.5 -	3.5 17.5 -	1.5 11 -	0.5 8.6 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.5 -	9 1.25 -	20 2.5 -	10 1.5 -	9 1.25 NE-E
Visibility, nautical miles	7	18	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	6.5 1	8 7	- -	- -
Precipitation (Occurrence)	All precipitation - 13% of the time				
Relative Humidity, %	63	85	98	-	-
Air Temperature, °C	19	22	25	22	-
Sea Surface Temperature, °C	22.5	24	25.5	-	-
Sea Level Pressure, millibars	1006	1015	1025	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	312 - -	- 1% 3%

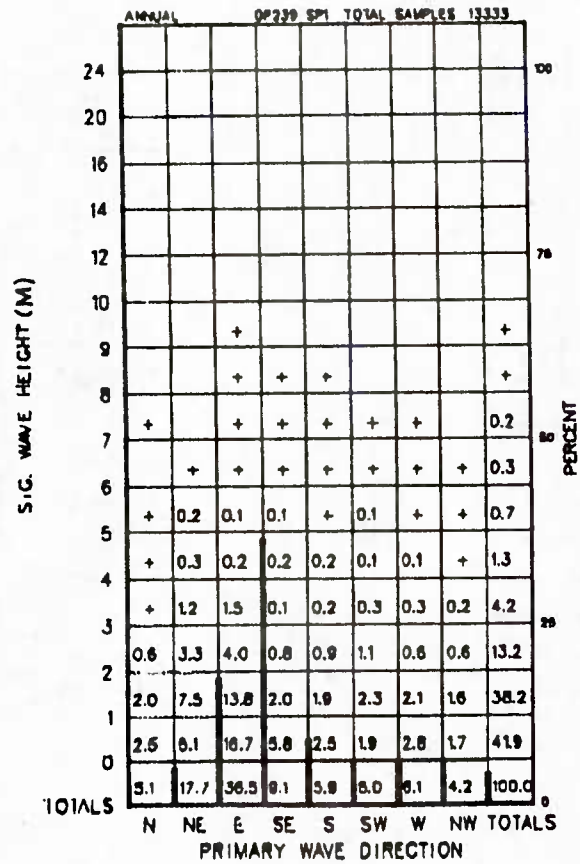


Figure A-239-1-3 Significant Wave Height vs. Primary Wave Direction

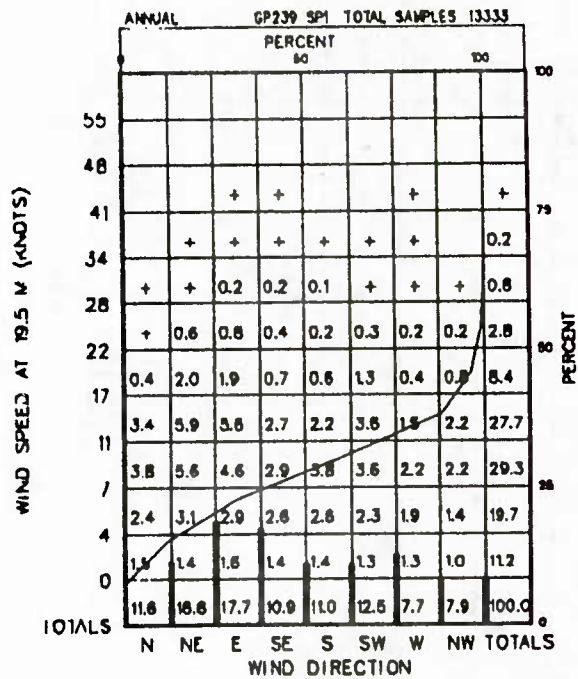


Figure A-239-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

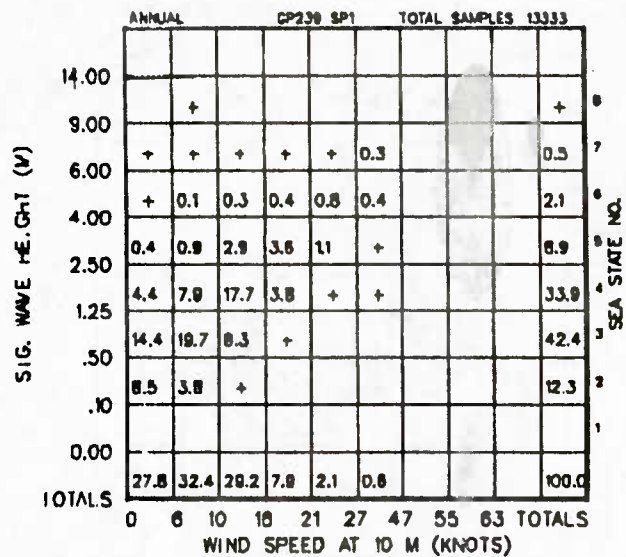


Figure A-239-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

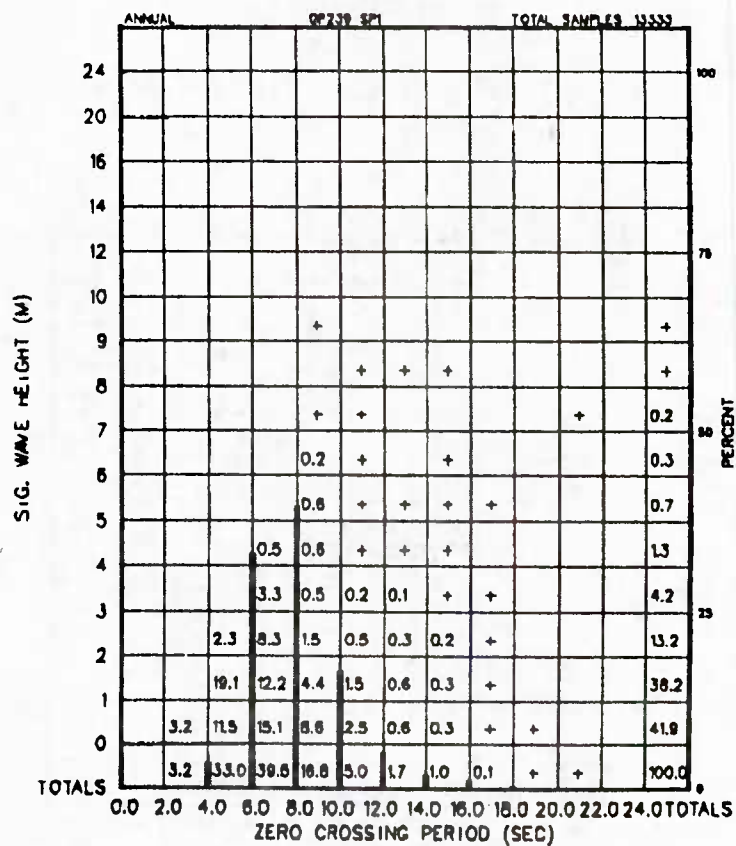
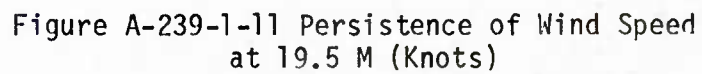


Figure A-239-1-6 Significant Wave Height vs. Zero Crossing Period



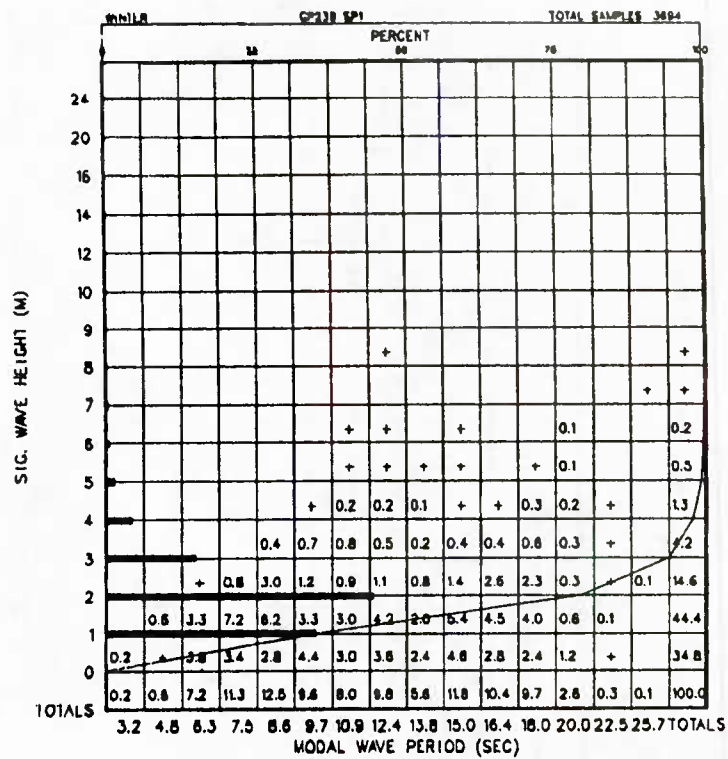


Figure A-239-2-1 Significant Wave Height vs. Modal Wave Period

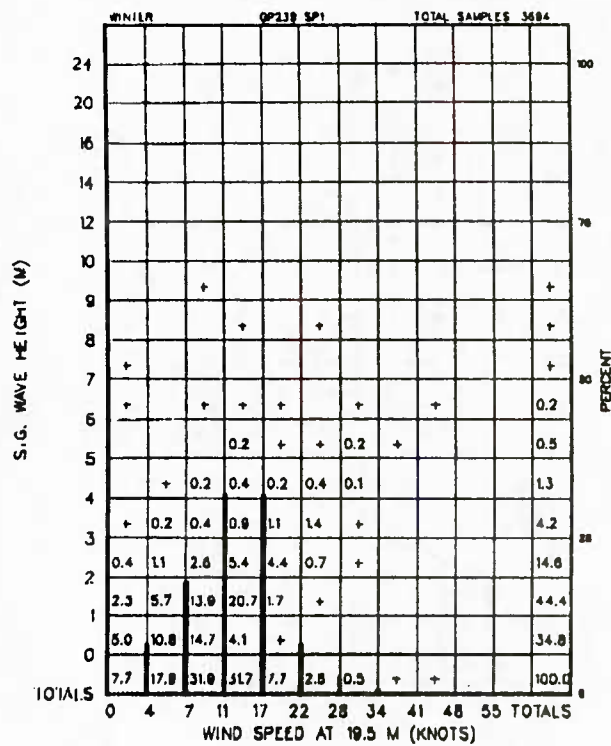


Figure A-239-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

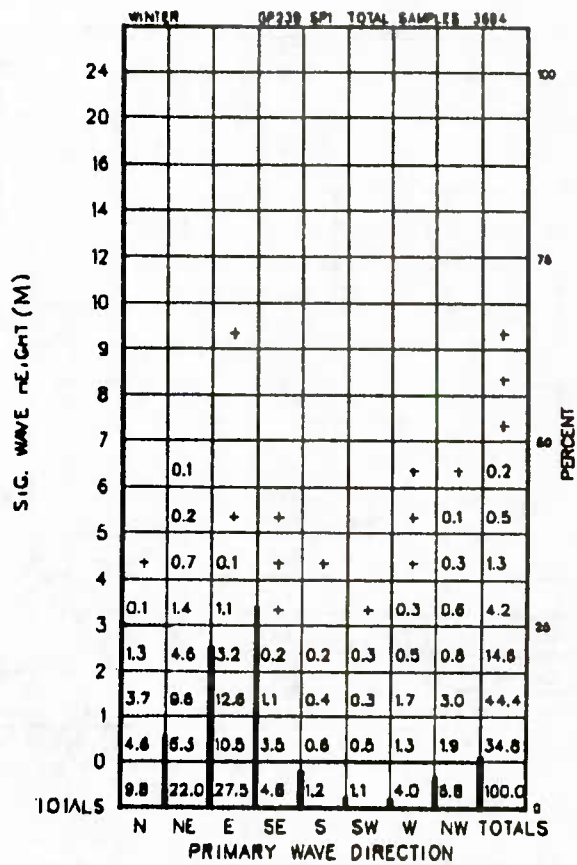


Figure A-239-2-3 Significant Wave Height vs. Primary Wave Direction

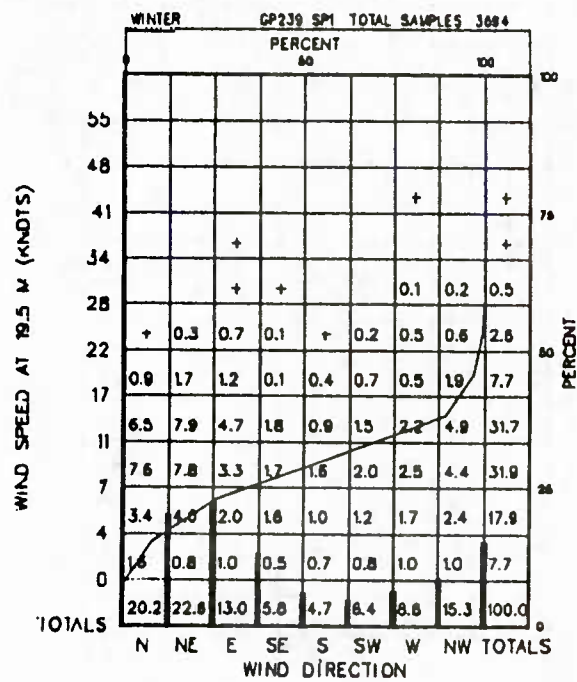


Figure A-239-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

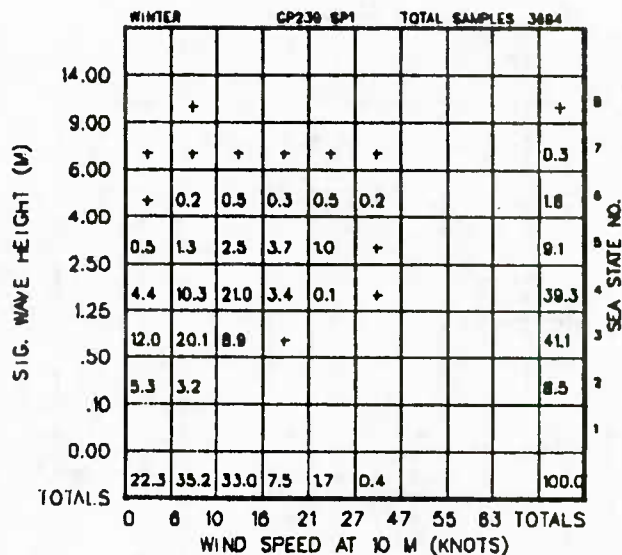


Figure A-239-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

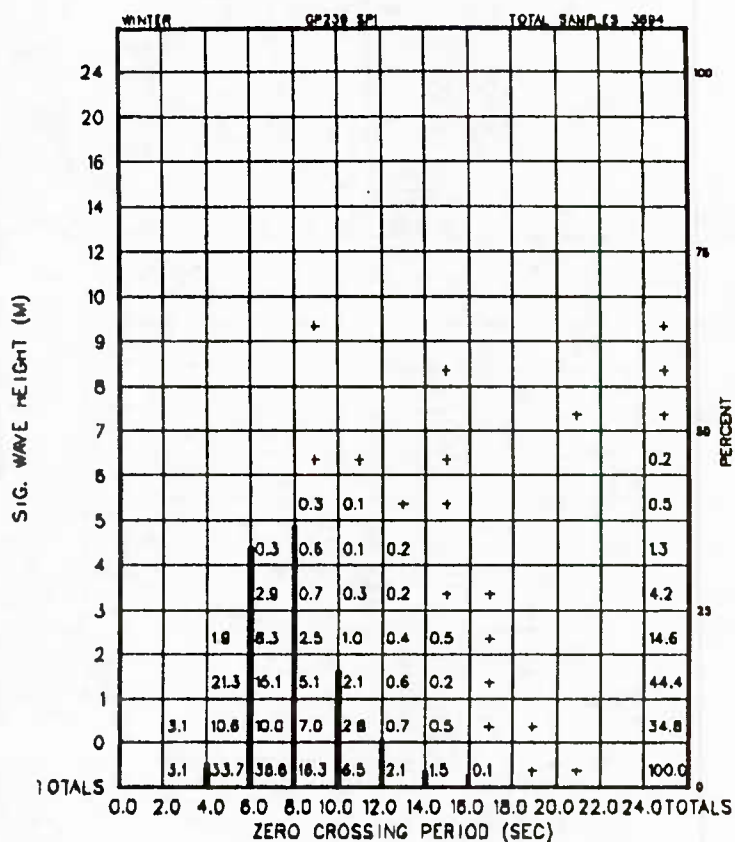
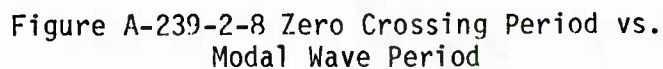
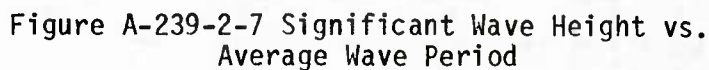


Figure A-239-2-6 Significant Wave Height vs. Zero Crossing Period





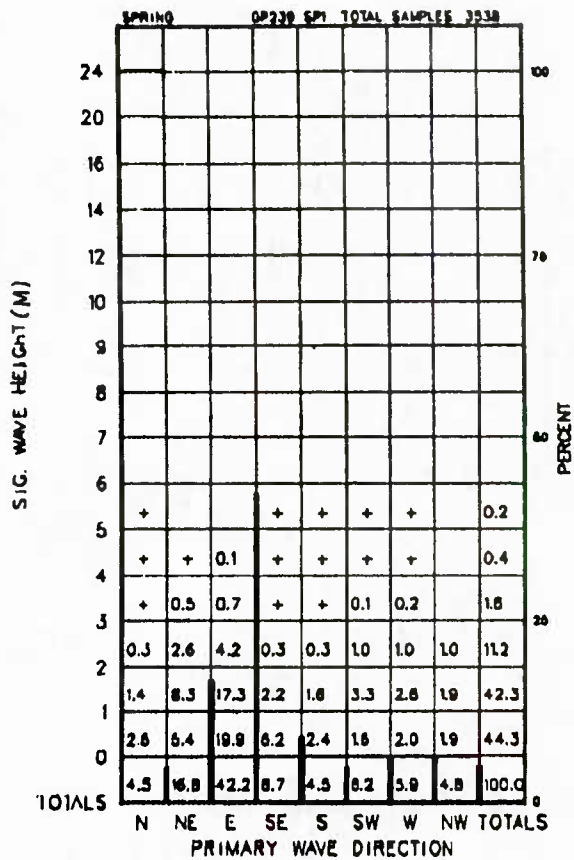


Figure A-239-3-3 Significant Wave Height vs. Primary Wave Direction

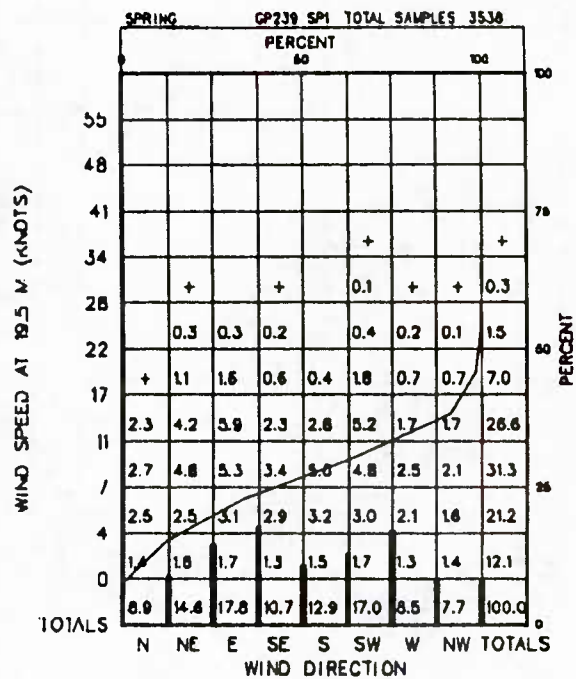


Figure A-239-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

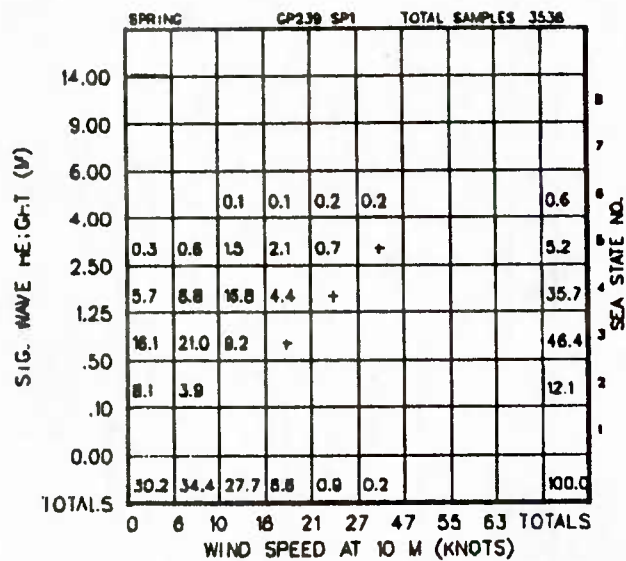


Figure A-239-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

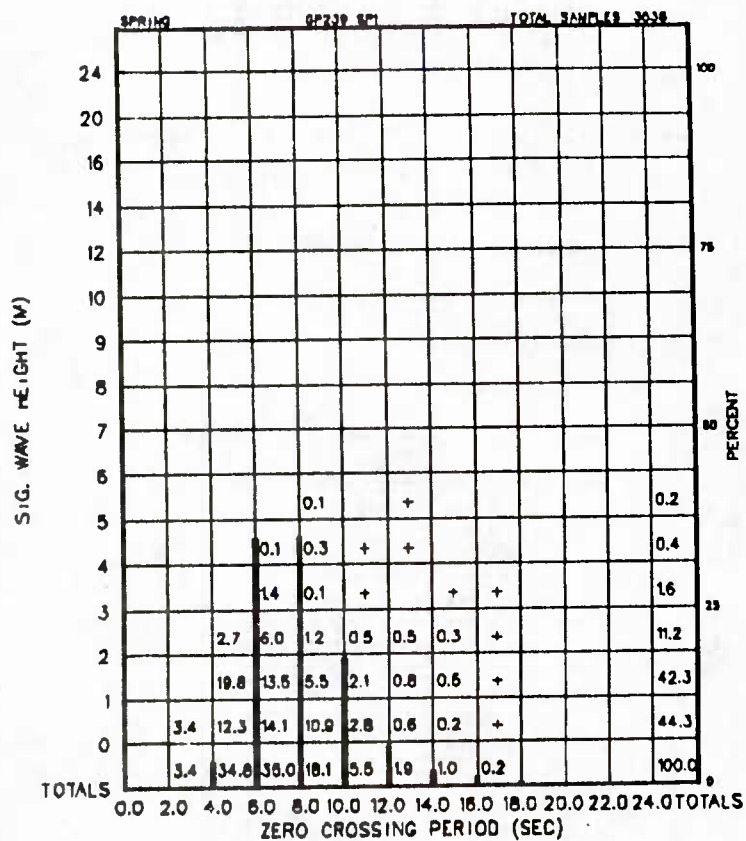


Figure A-239-3-6 Significant Wave Height vs. Zero Crossing Period

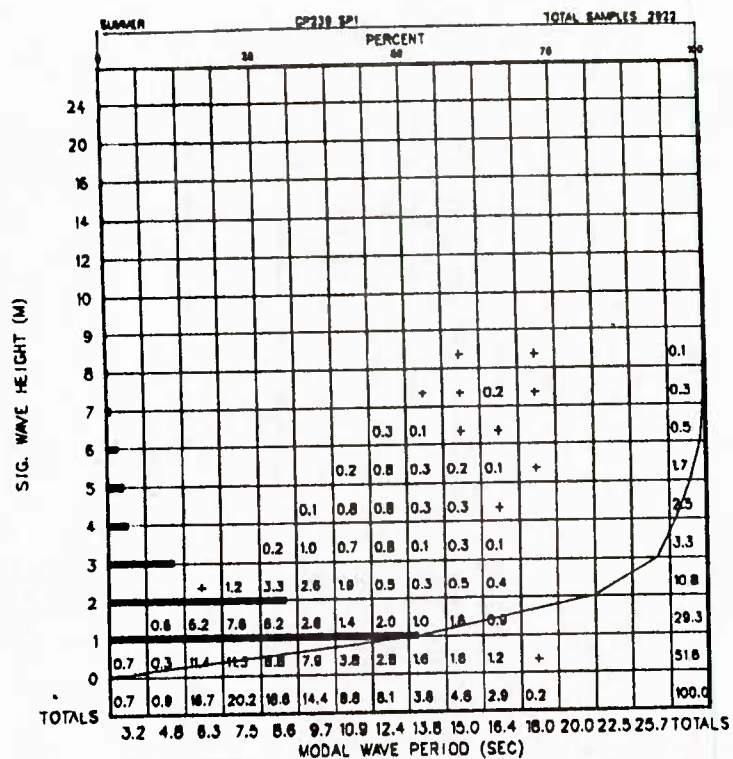


Figure A-239-4-1 Significant Wave Height vs. Modal Wave Period

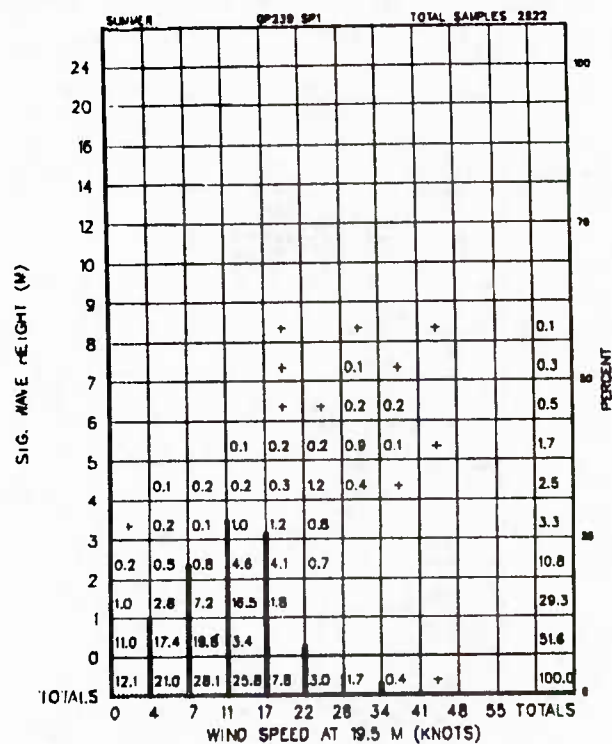


Figure A-239-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

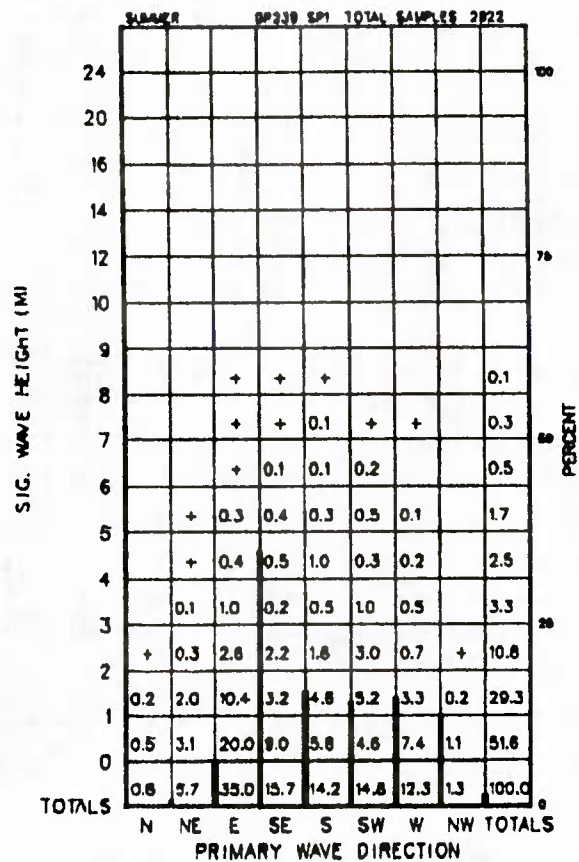


Figure A-239-4-3 Significant Wave Height vs. Primary Wave Direction

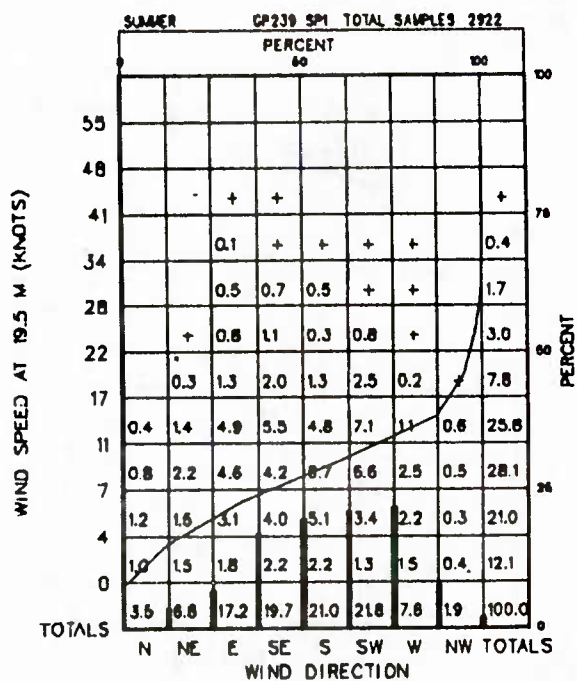


Figure A-239-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

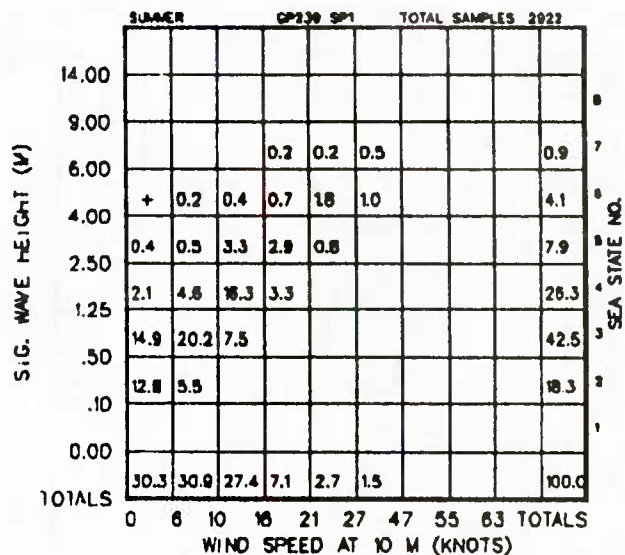


Figure A-239-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

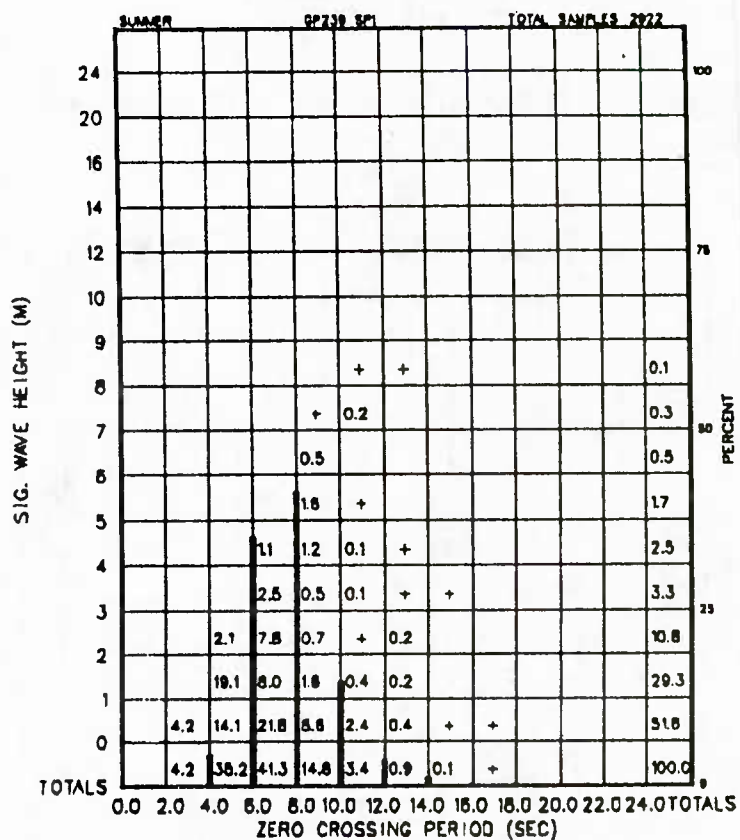


Figure A-239-4-6 Significant Wave Height vs. Zero Crossing Period

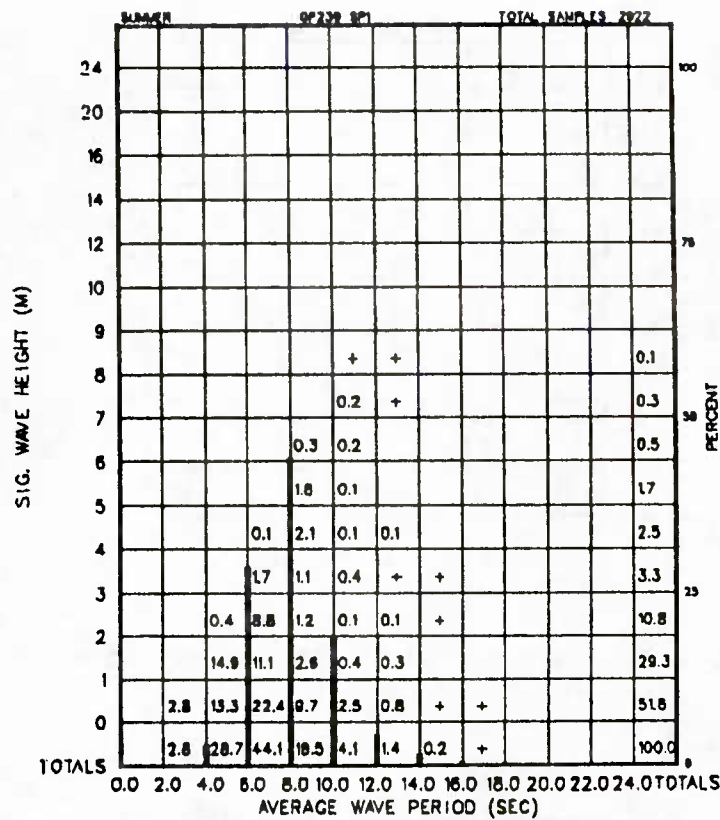


Figure A-239-4-7 Significant Wave Height vs. Average Wave Period

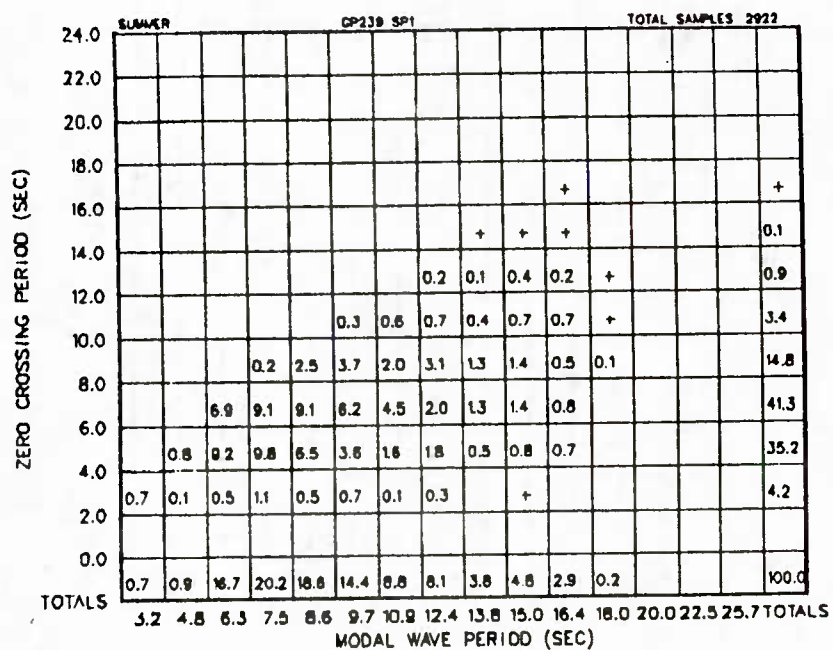


Figure A-239-4-8 Zero Crossing Period vs. Modal Wave Period

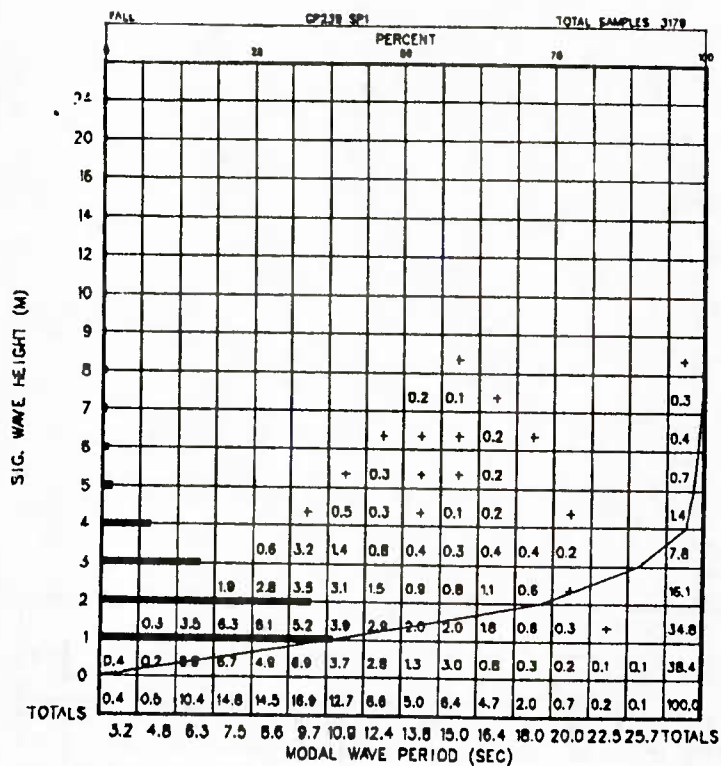


Figure A-239-5-1 Significant Wave Height vs. Modal Wave Period

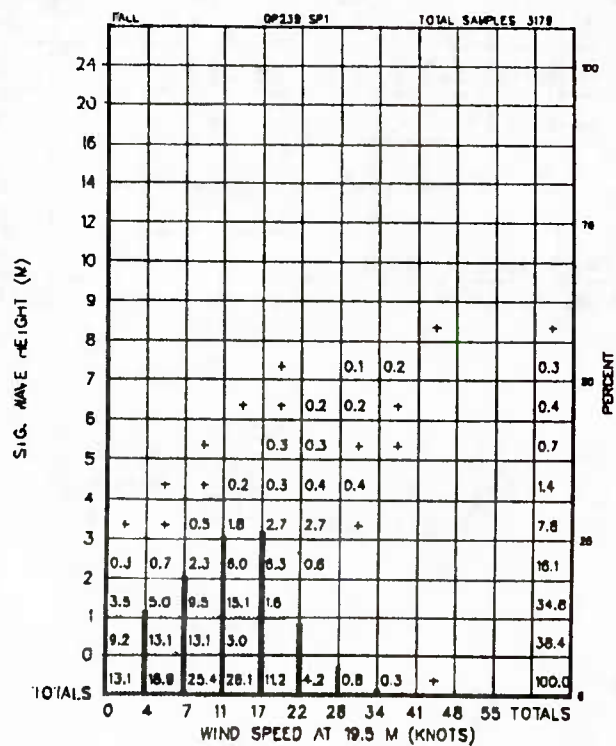


Figure A-239-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

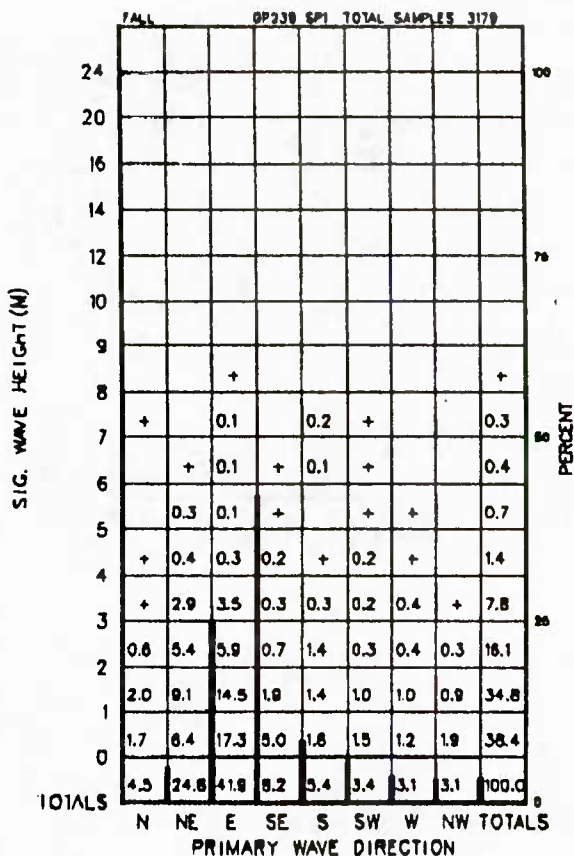


Figure A-239-5-3 Significant Wave Height vs. Primary Wave Direction

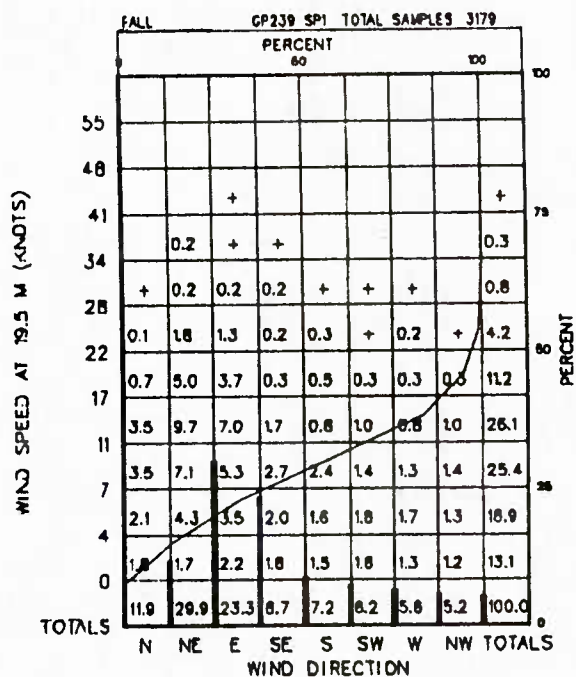


Figure A-239-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

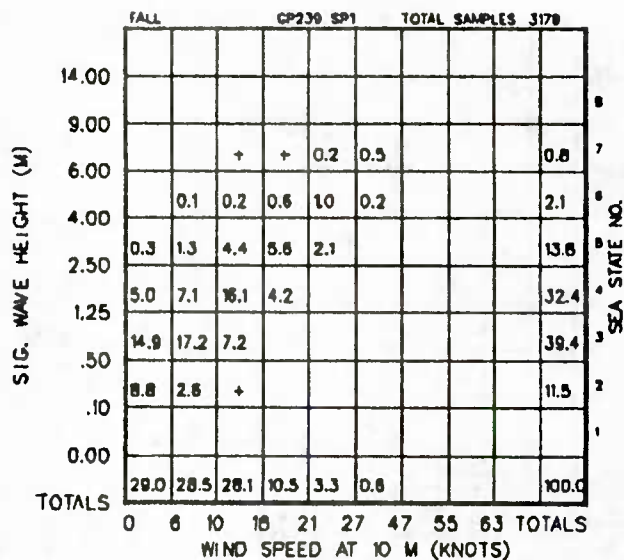


Figure A-239-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

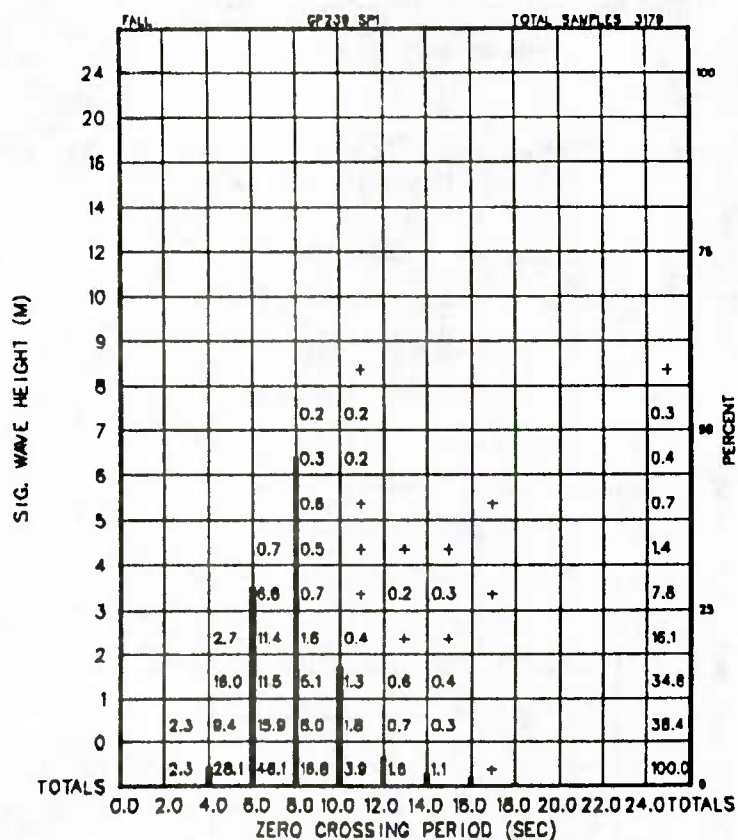


Figure A-239-5-6 Significant Wave Height vs. Zero Crossing Period

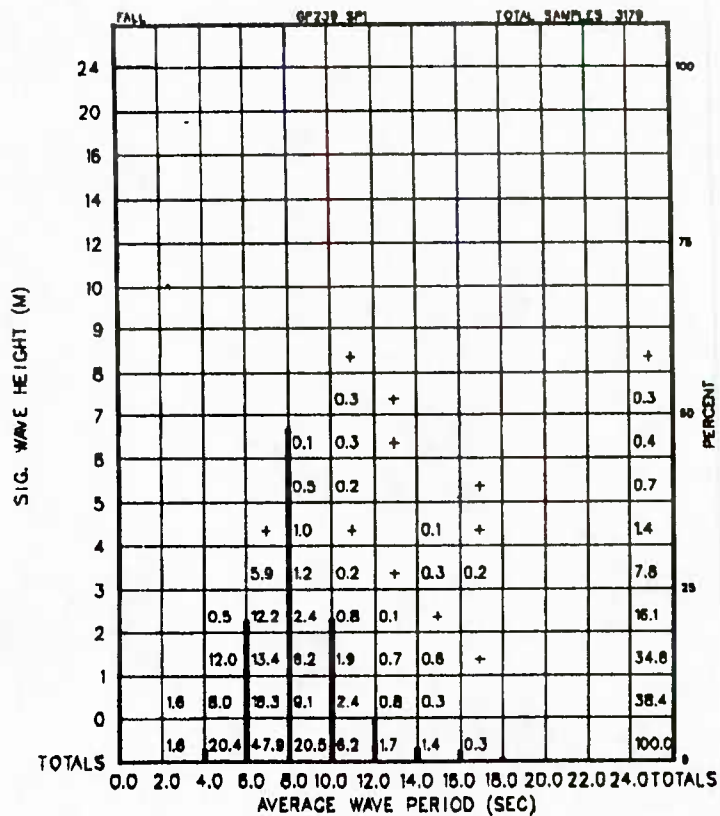


Figure A-239-5-7 Significant Wave Height vs. Average Wave Period

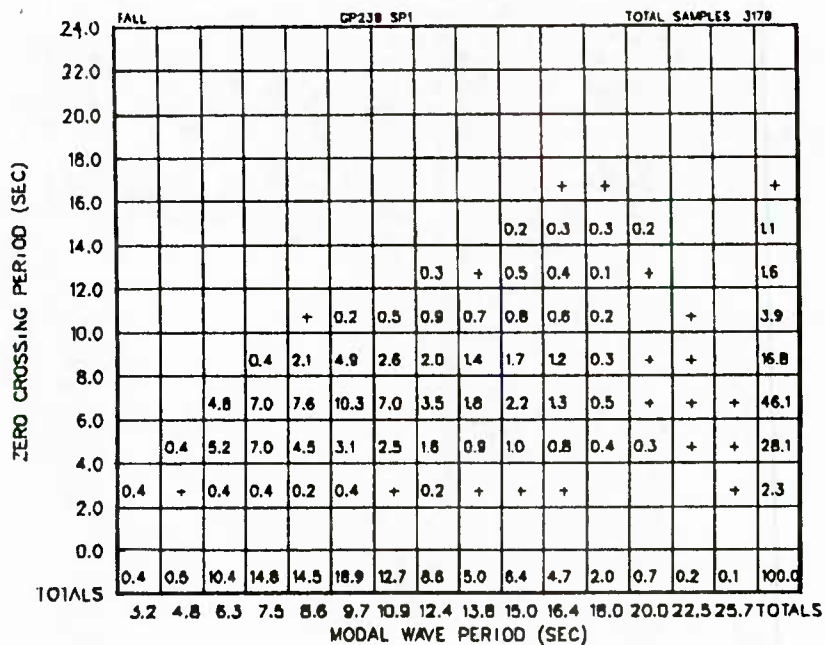


Figure A-239-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-255-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 26.02°N, 148.2°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	3.5 17.5 -	1.5 11 -	1.5 9.7 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.25 -	9 1.25 -	21 3.5 -	10 1.5 -	9 1.25 E
Visibility, nautical miles	3	12	25	-	-
Cloud Cover Total clouds, in eighths of sky obscured Low clouds, in eighths of sky obscured	1 0	6.5 5.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 16% of the time				
Relative Humidity, %	60	83	98	-	-
Air Temperature, °C	14	18	22	18	-
Sea Surface Temperature, °C	18	22	24.5	-	-
Sea Level Pressure, millibars	1000	1015	1026	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	372 - -	- 1% 3%

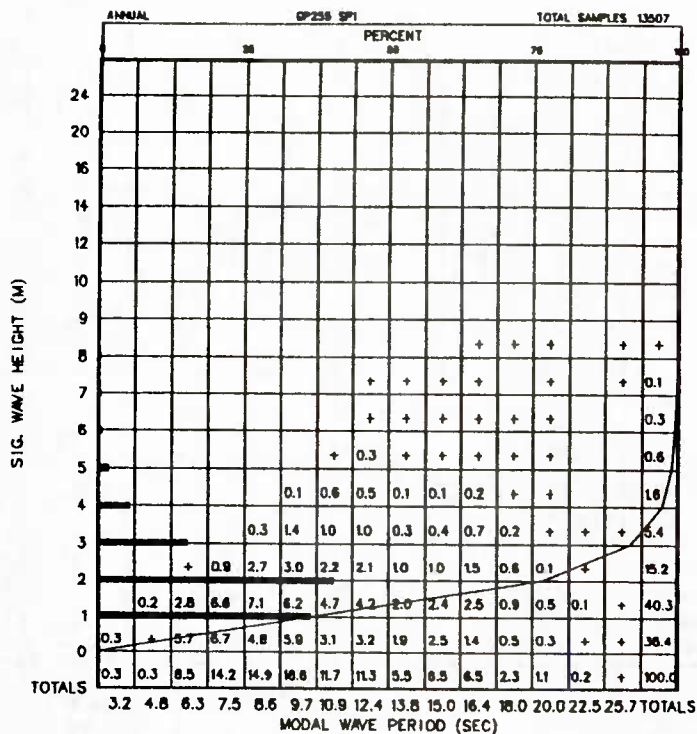


Figure A-255-1-1 Significant Wave Height vs. Modal Wave Period

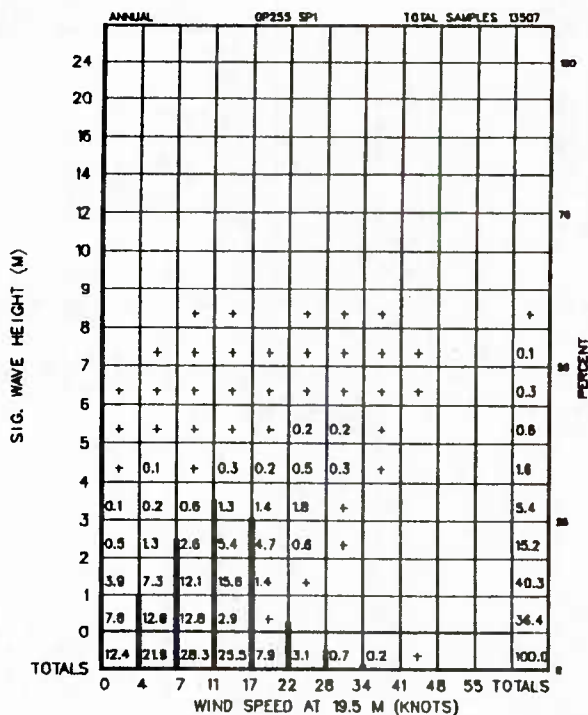


Figure A-255-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

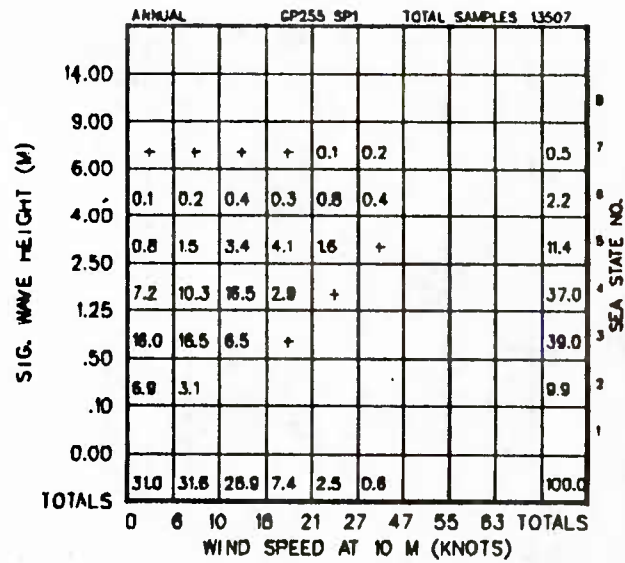


Figure A-255-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

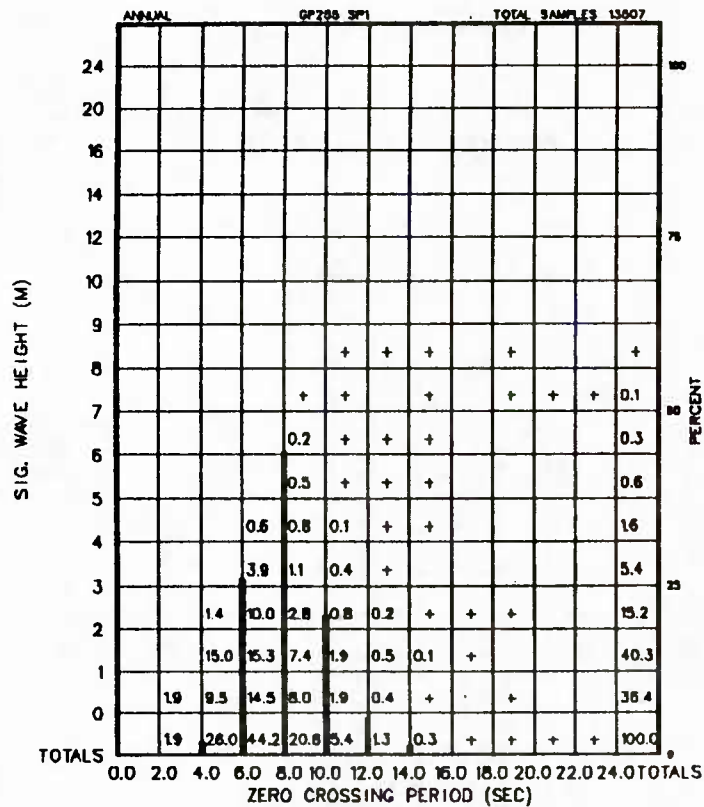
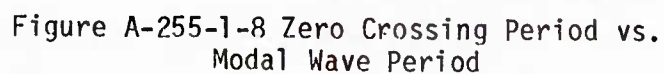
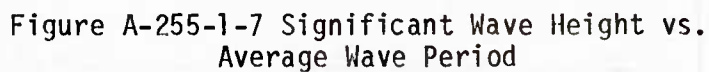
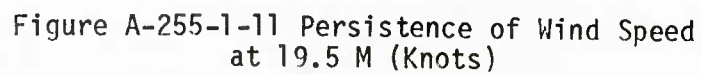


Figure A-255-1-6 Significant Wave Height vs. Zero Crossing Period





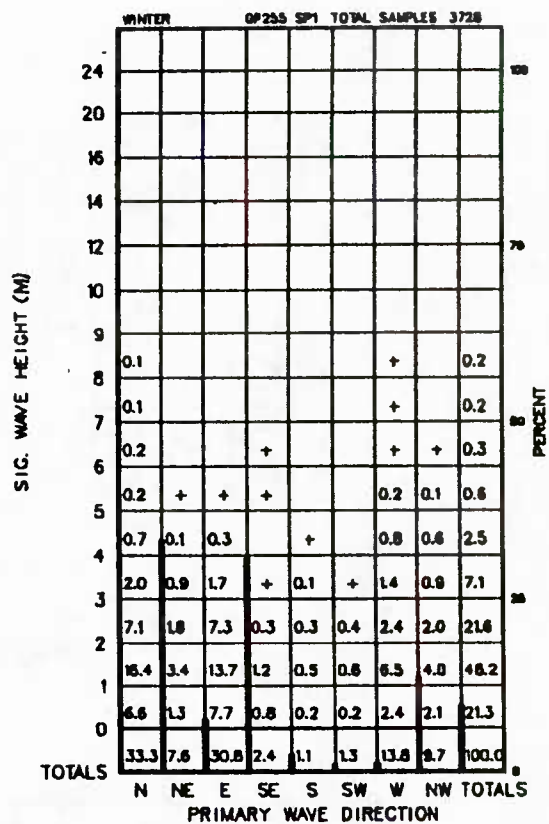


Figure A-255-2-3 Significant Wave Height vs. Primary Wave Direction

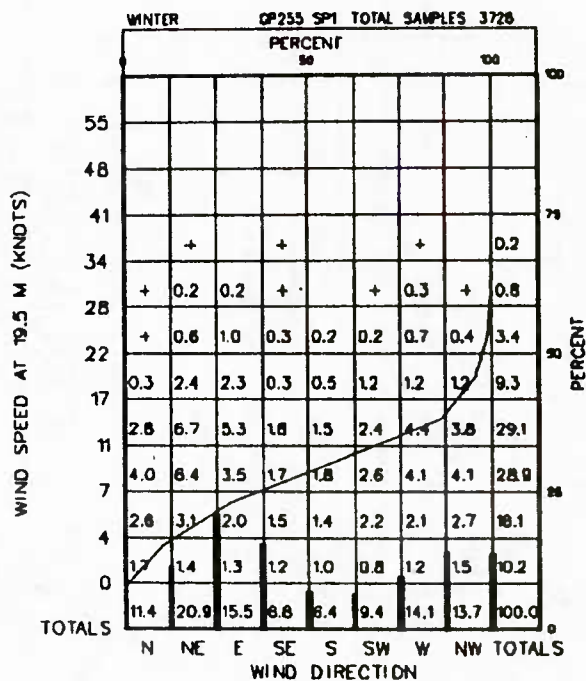


Figure A-255-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

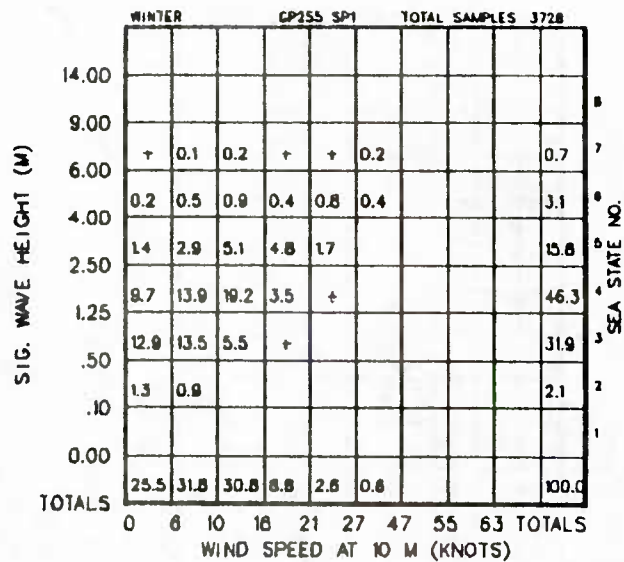


Figure A-255-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

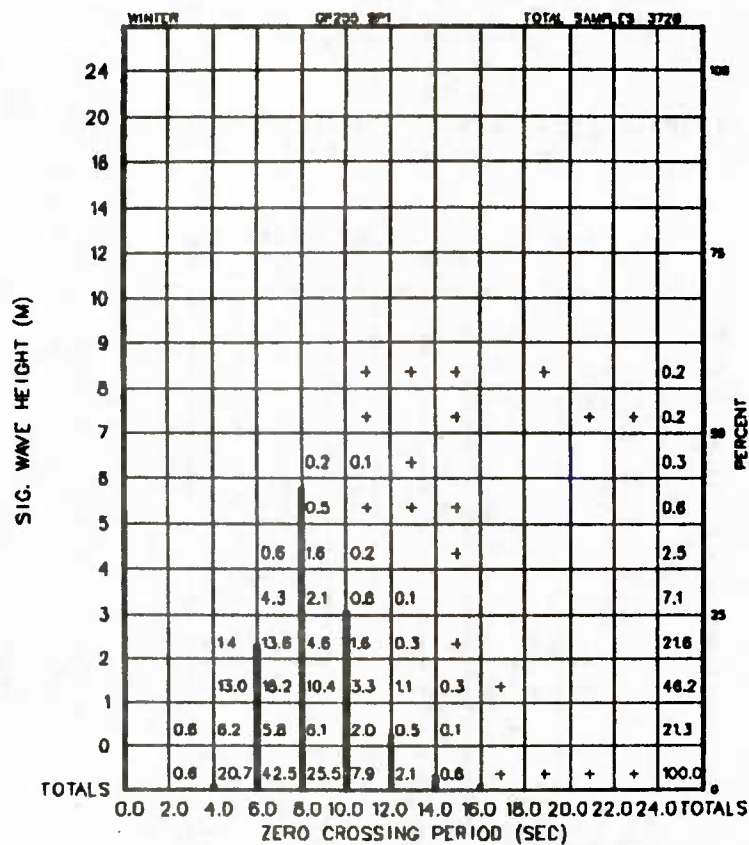


Figure A-255-2-6 Significant Wave Height vs. Zero Crossing Period

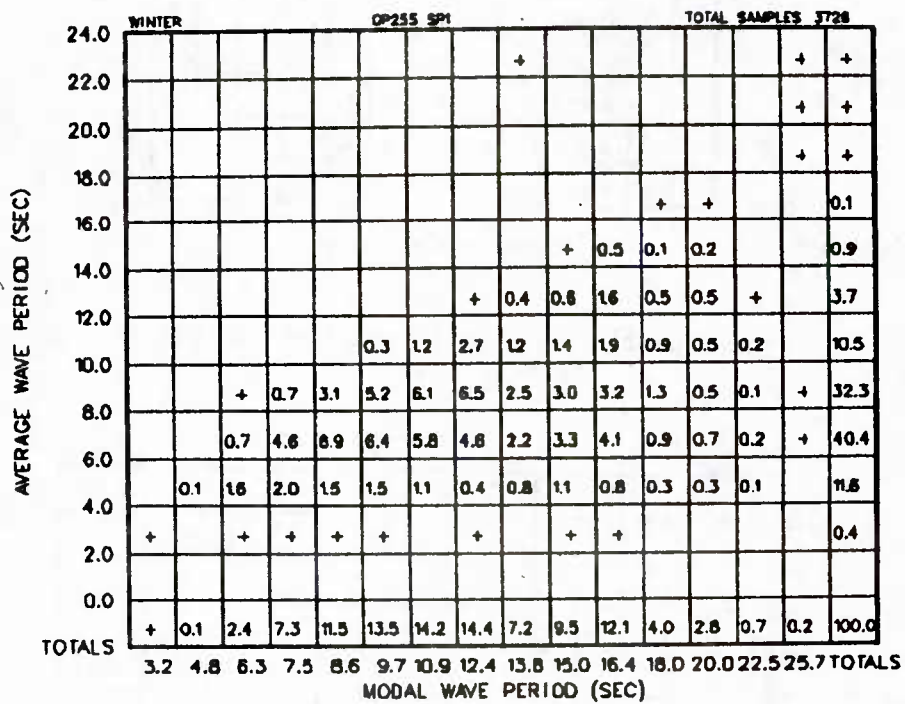


Figure A-255-2-9 Average Wave Period vs.
Modal Wave Period

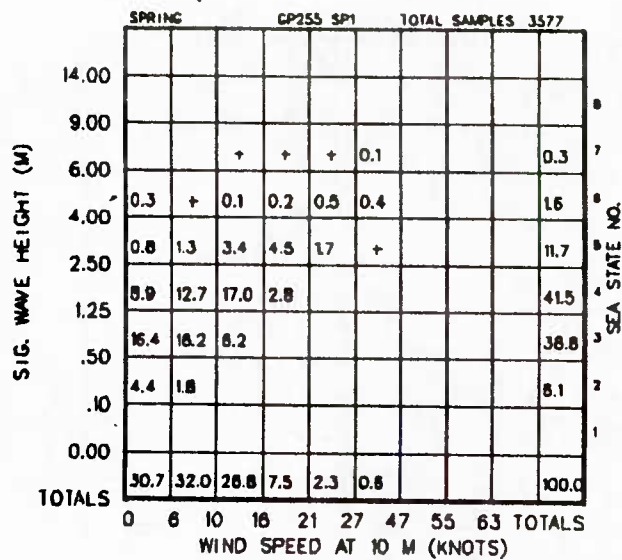


Figure A-255-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

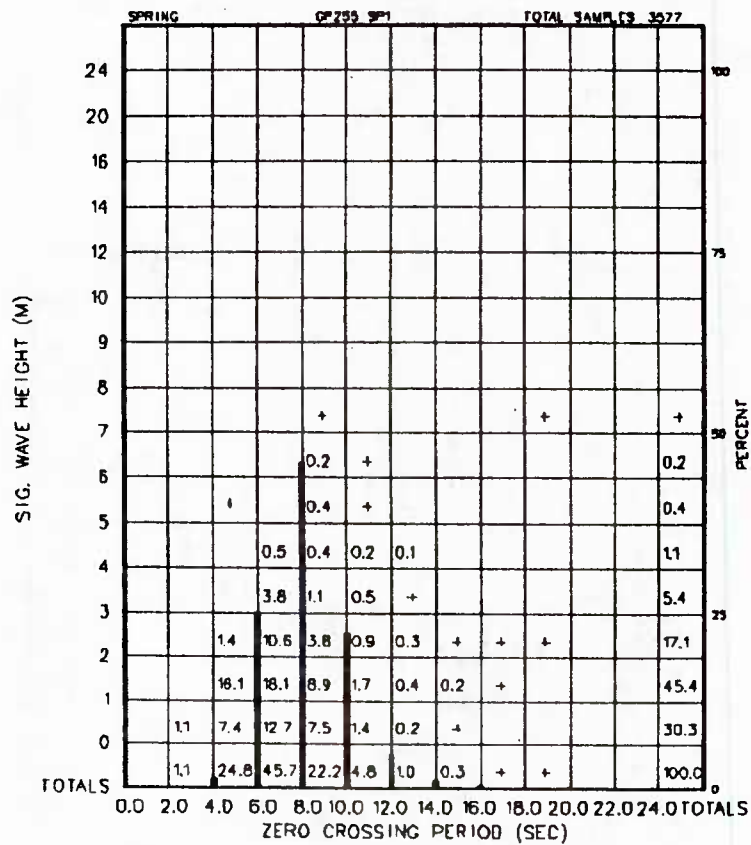


Figure A-255-3-6 Significant Wave Height vs. Zero Crossing Period

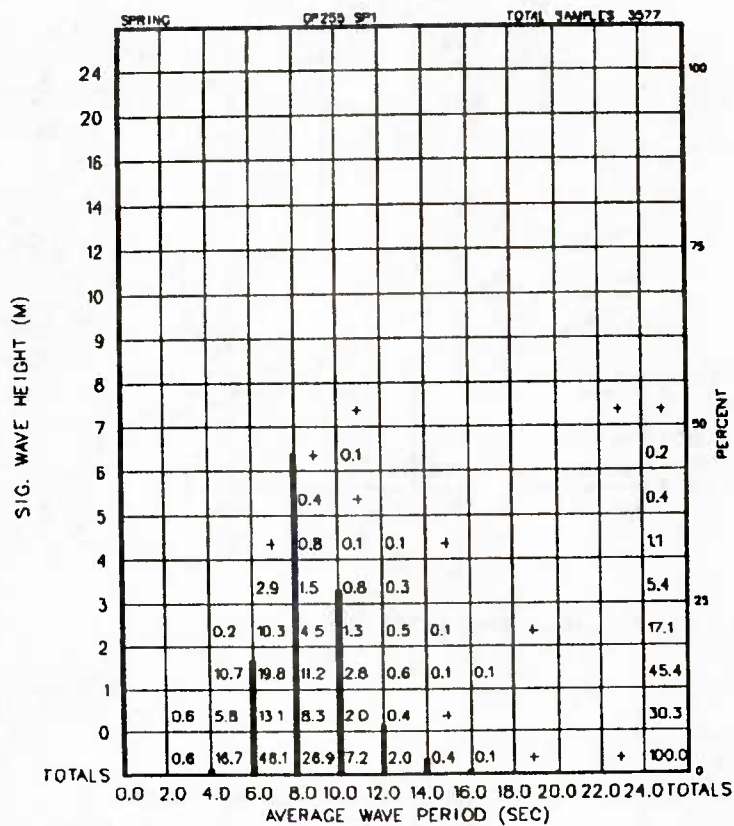


Figure A-255-3-7 Significant Wave Height vs. Average Wave Period

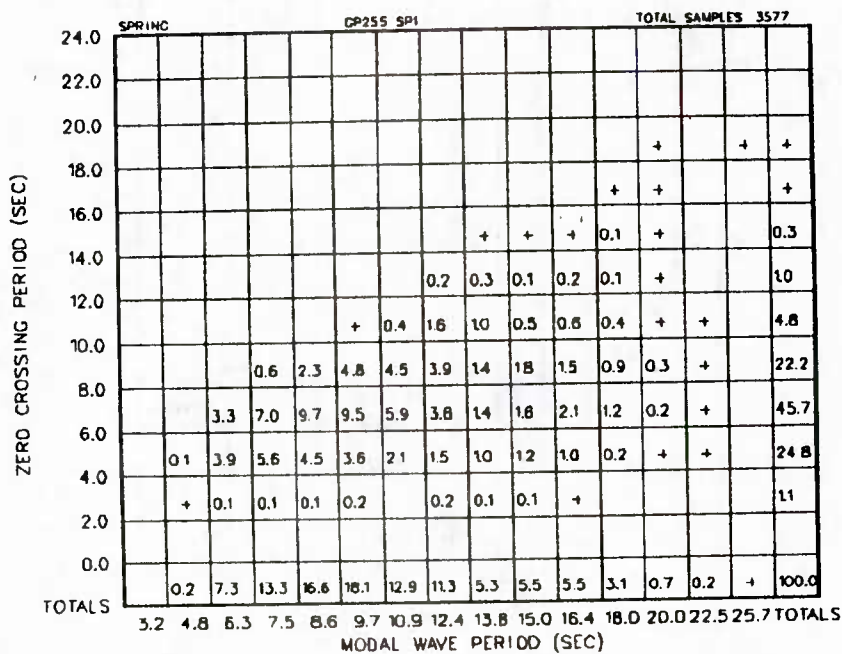


Figure A-255-3-8 Zero Crossing Period vs. Modal Wave Period

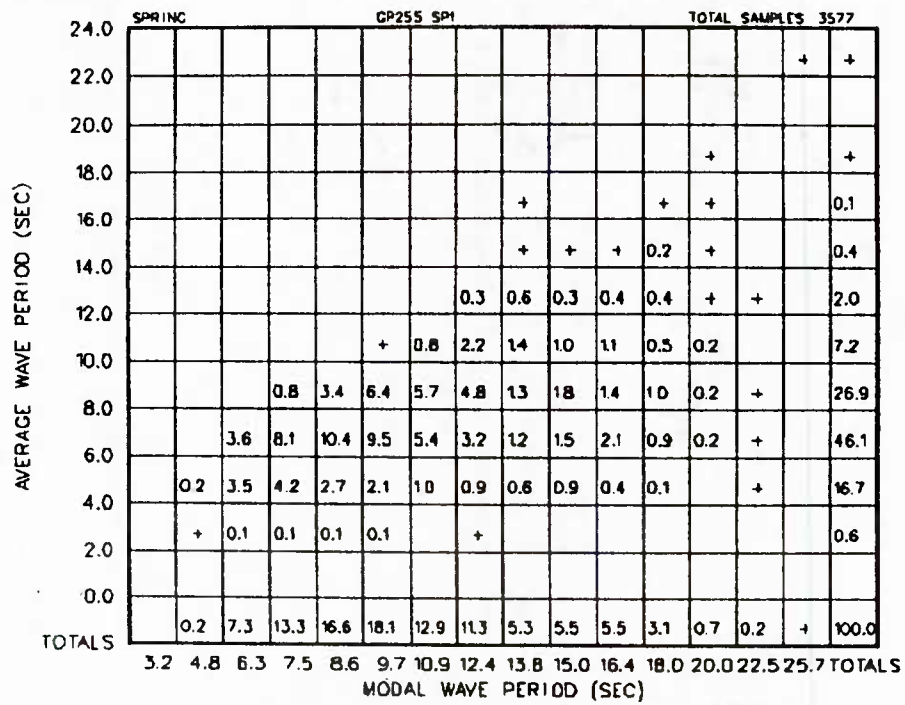


Figure A-255-3-9 Average Wave Period vs.
Modal Wave Period

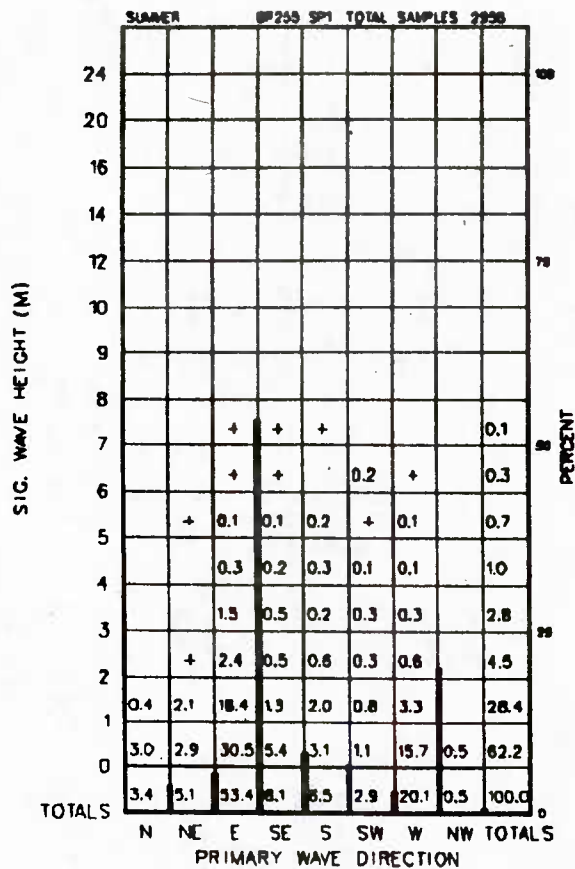


Figure A-255-4-3 Significant Wave Height vs. Primary Wave Direction

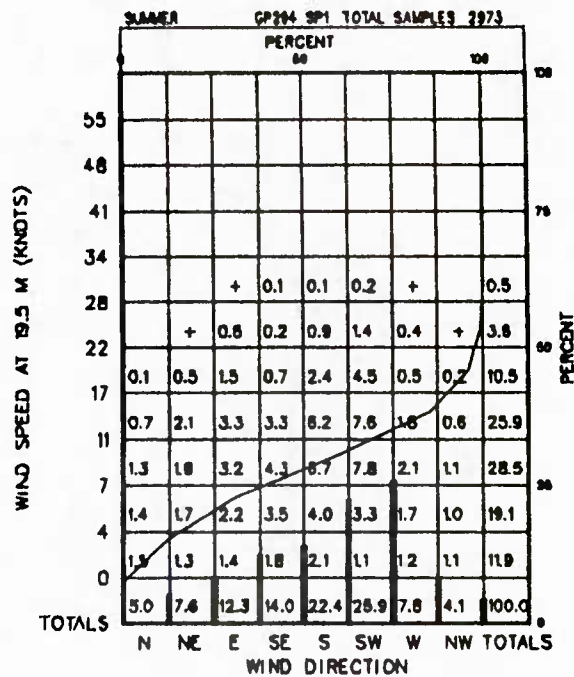


Figure A-255-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

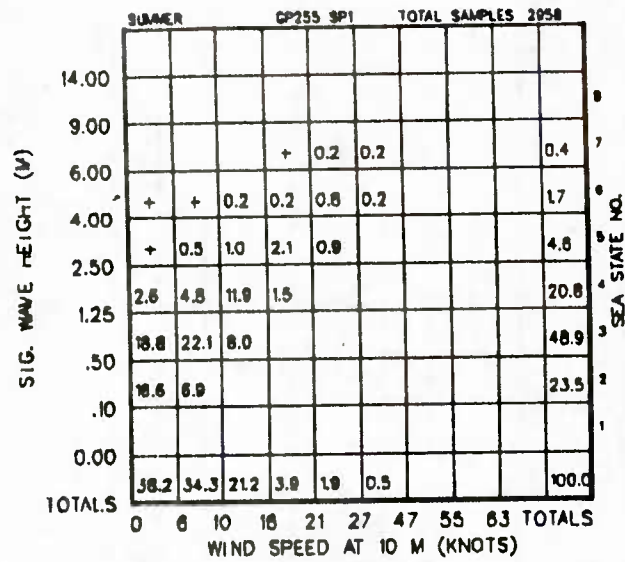


Figure A-255-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

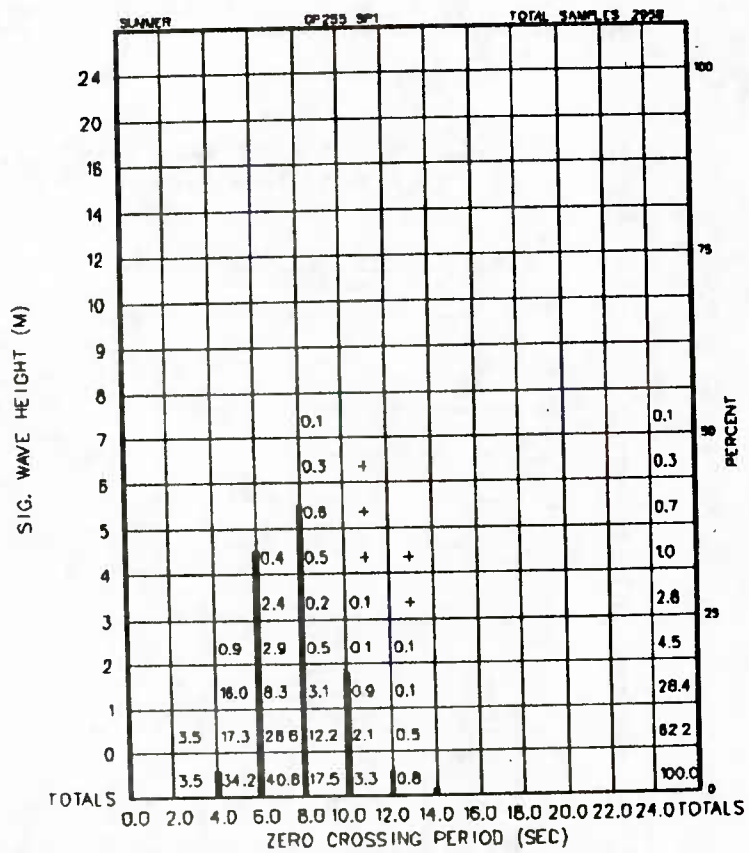


Figure A-255-4-6 Significant Wave Height vs. Zero Crossing Period

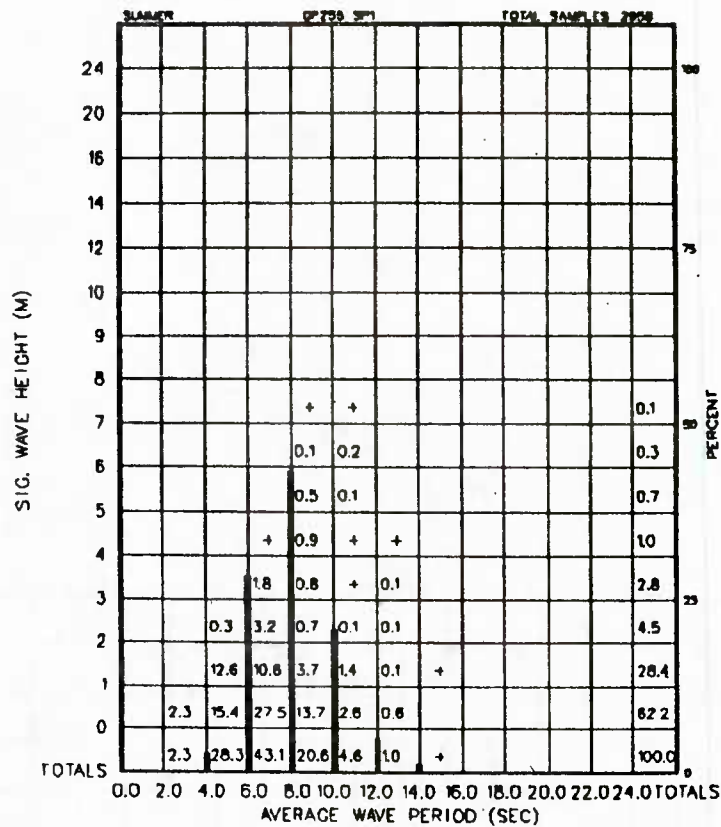


Figure A-255-4-7 Significant Wave Height vs. Average Wave Period

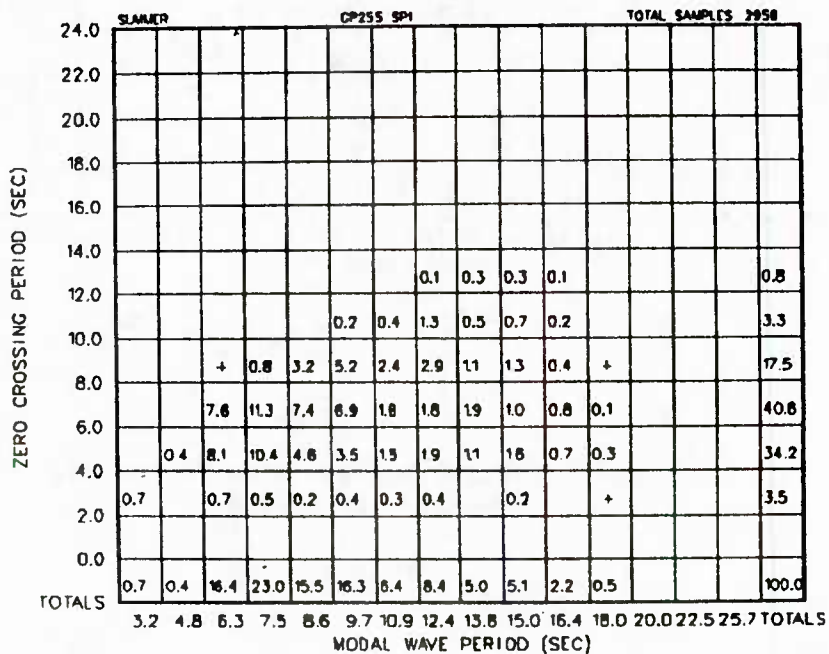


Figure A-255-4-8 Zero Crossing Period vs. Modal Wave Period



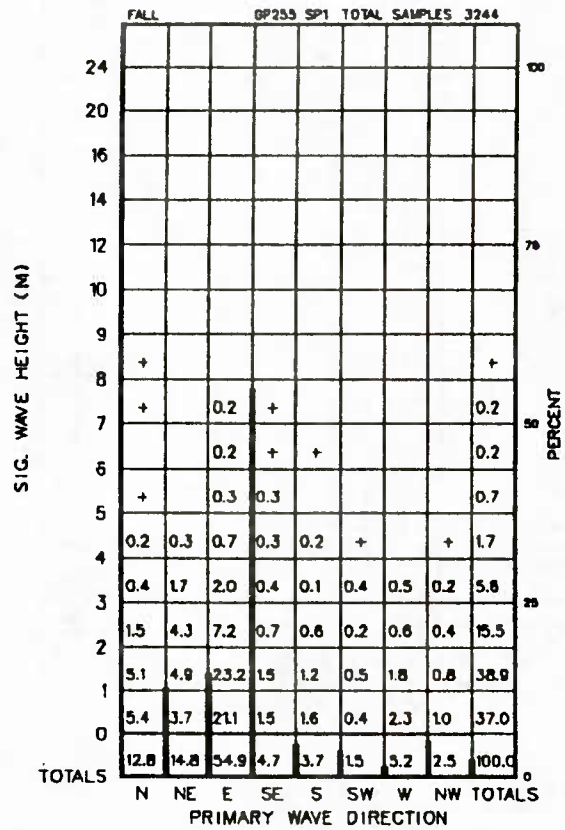


Figure A-255-5-3 Significant Wave Height vs. Primary Wave Direction

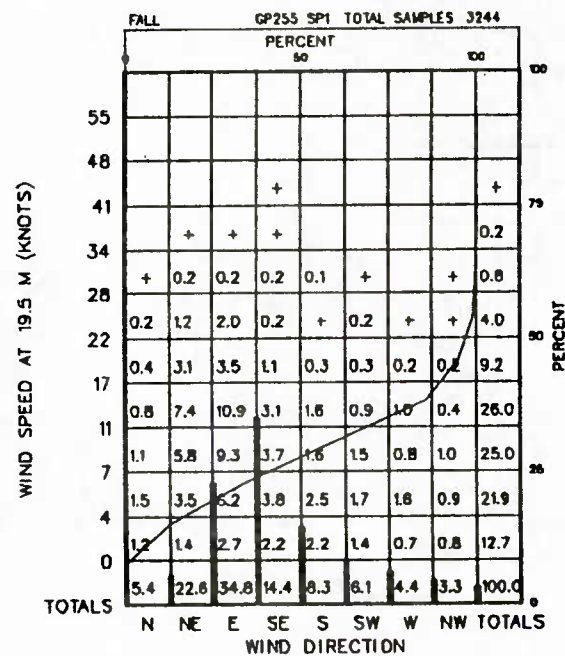


Figure A-255-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

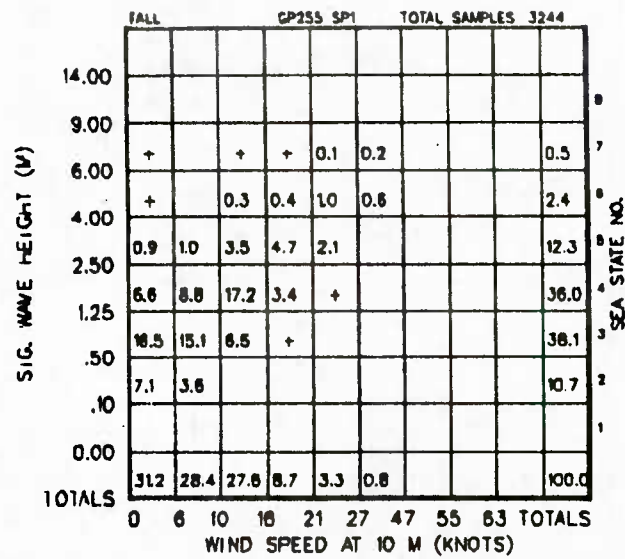


Figure A-255-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

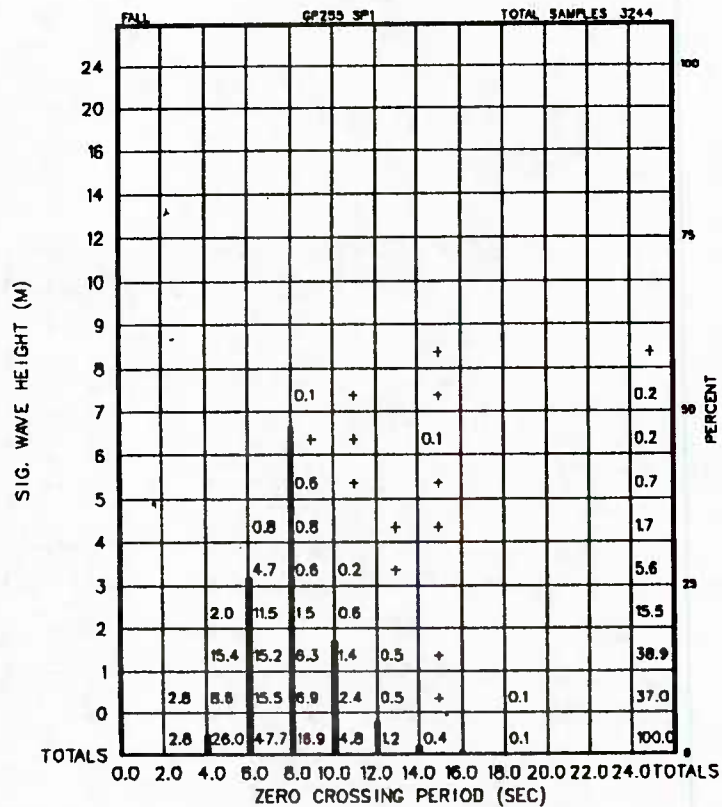


Figure A-255-5-6 Significant Wave Height vs. Zero Crossing Period

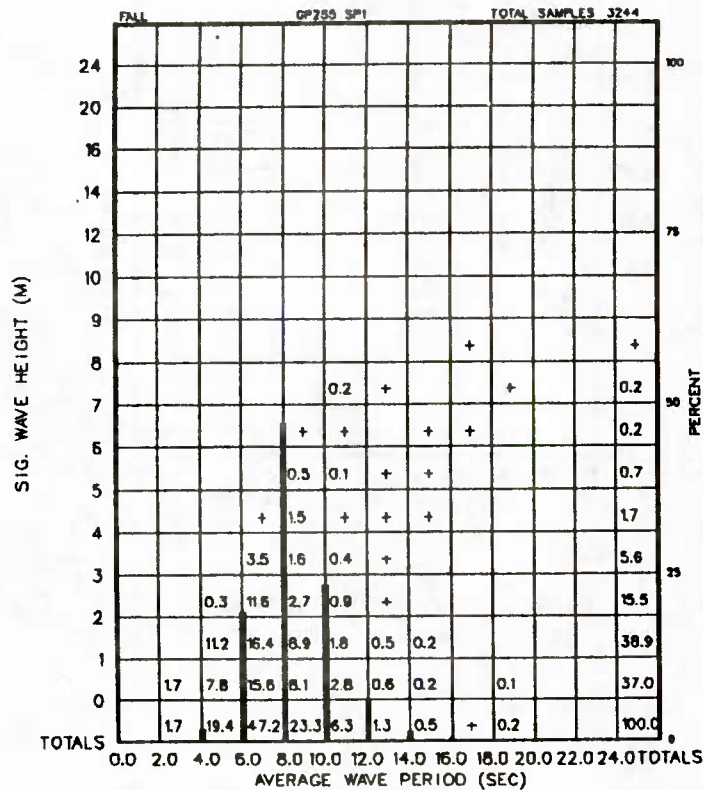


Figure A-255-5-7 Significant Wave Height vs. Average Wave Period

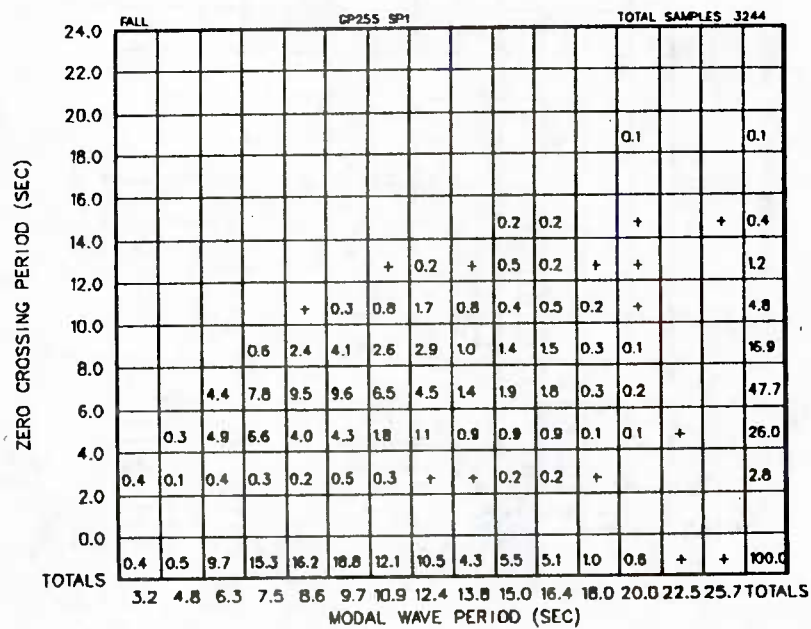


Figure A-255-5-8 Zero Crossing Period vs. Modal Wave Period



TABLE A-294-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 36.32°N, 148.51°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	5.0 17.5 -	2.0 11 -	1.5 8.6 S
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12 1.75 -	28 3.5 -	14 2 -	14 2 S-SW-NW
Visibility, nautical miles	3	15	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	7 3	8 7.5	- -	- -
Precipitation (Occurrence)	All precipitation - 19% of the time Snow - 5% of the time (Dec-Mar)				
Relative Humidity, %	63	85	98	-	-
Air Temperature, °C	8.5	13	17	13	-
Sea Surface Temperature, °C	14.5	17	19.5	-	-
Sea Level Pressure, millibars	995	1015	1026	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	322 - -	- 14 24

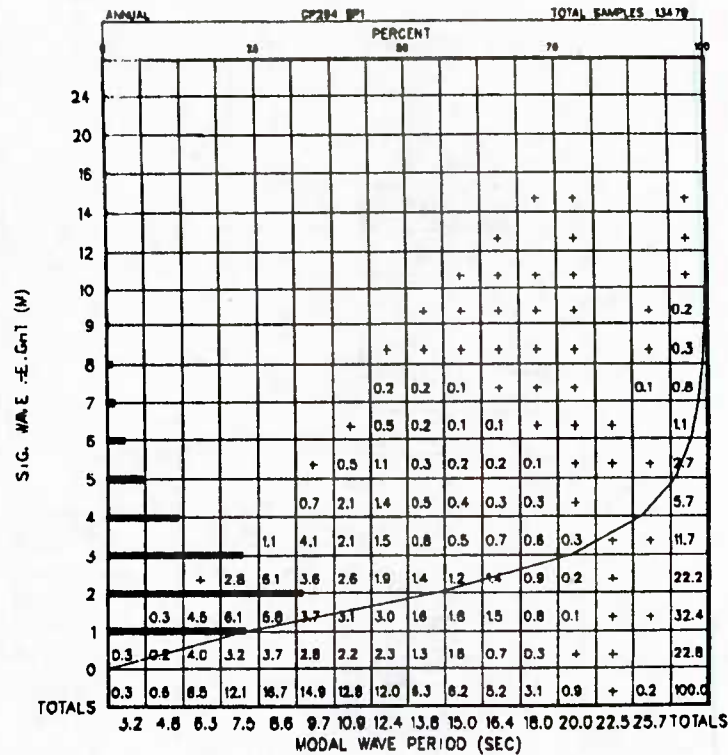


Figure A-294-1-1 Significant Wave Height vs. Modal Wave Period

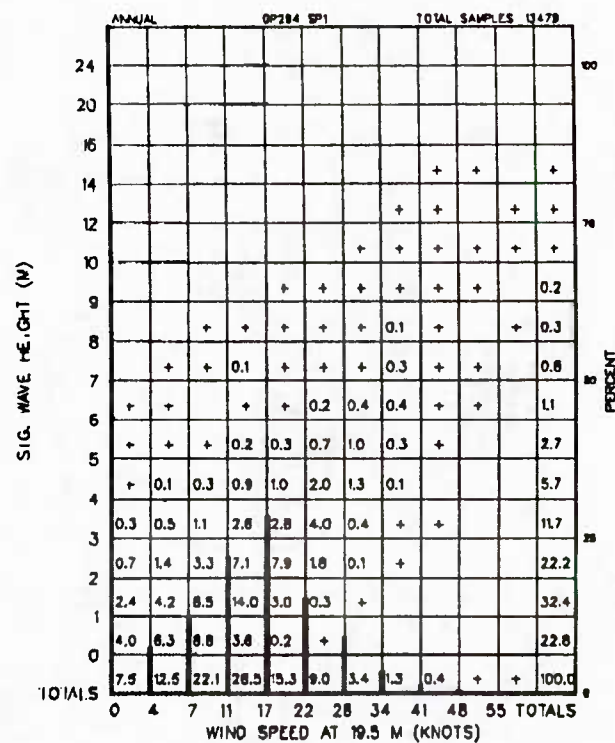


Figure A-294-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

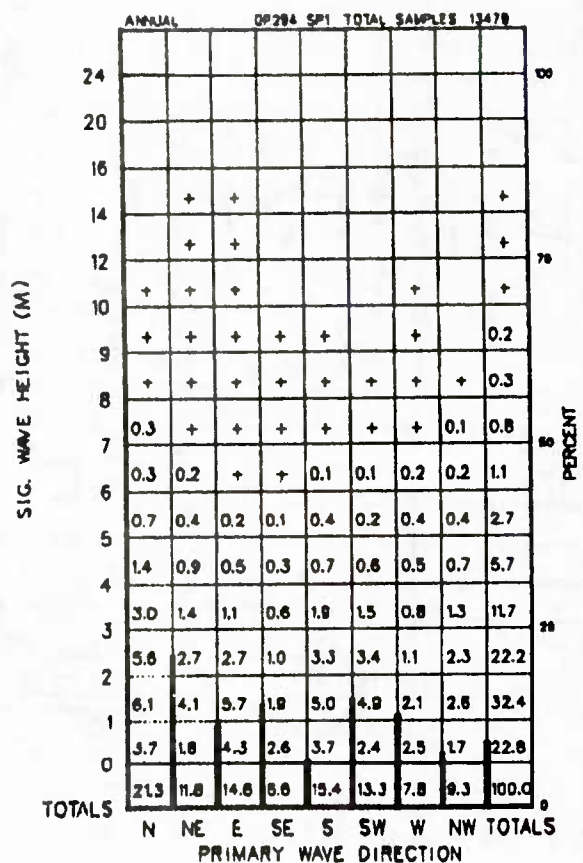


Figure A-294-1-3 Significant Wave Height vs. Primary Wave Direction

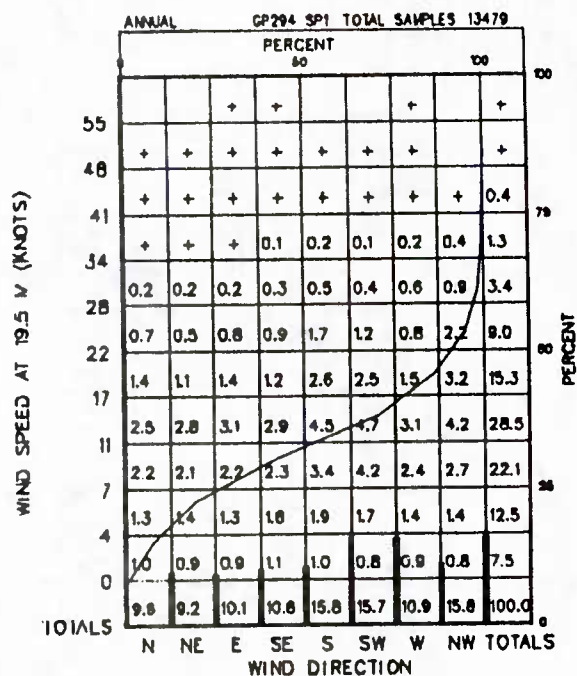


Figure A-294-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

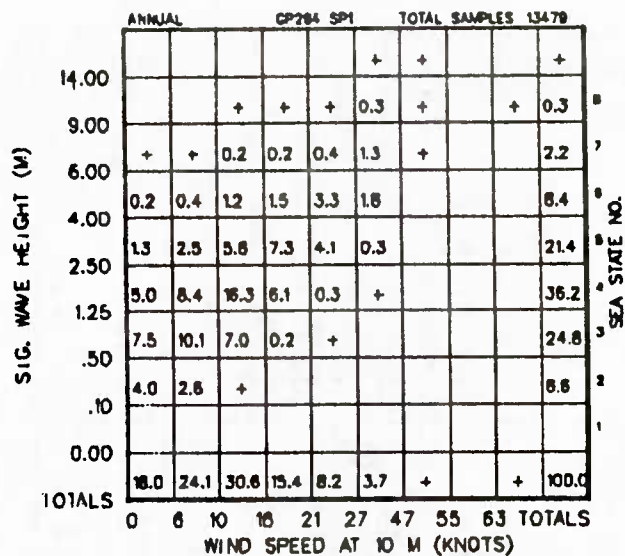


Figure A-294-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

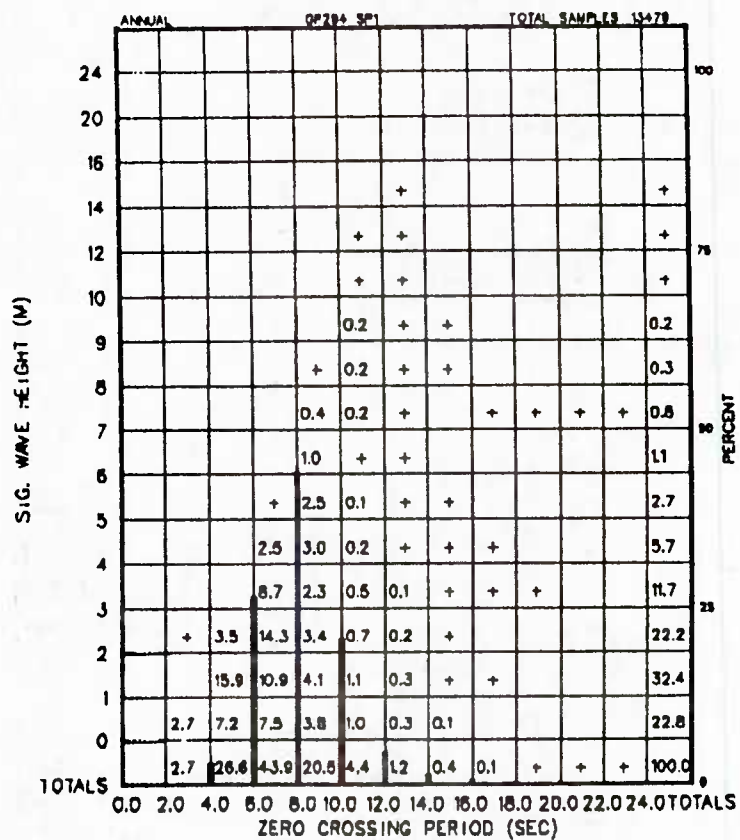


Figure A-294-1-6 Significant Wave Height vs. Zero Crossing Period

ANNUAL		CP284 SP1												TOTAL SAMPLES 13478														
WIND SPEED AT 19.5 M (KNOTS)																											PERCENT	
55	2		1																							3	80	
48	5	2	1																								8	
41	31	7		1																							39	70
34	93	21	12	1																							127	
28	225	72	22	1	2	1																					323	
22	445	182	89	23	12	5	1		1																		738	50
17	801	281	116	39	17	8	8	3	1				1	1	1												1253	
11	1002	462	198	127	63	23	23	10	4	3	1	3															1919	35
7	1038	368	152	74	28	18	12	8	2	1									1								1703	
4	783	231	71	34	8	8	3	1		1	1																1117	
0	450	122	38	17	12	3	1	1	2										1						1		629	
TOTALS	4835	1728	681	317	140	62	48	24	10	5	2	4	1	1		1	1							1			7859	0
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS					
		DURATION (HOURS)																										

Figure A-294-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

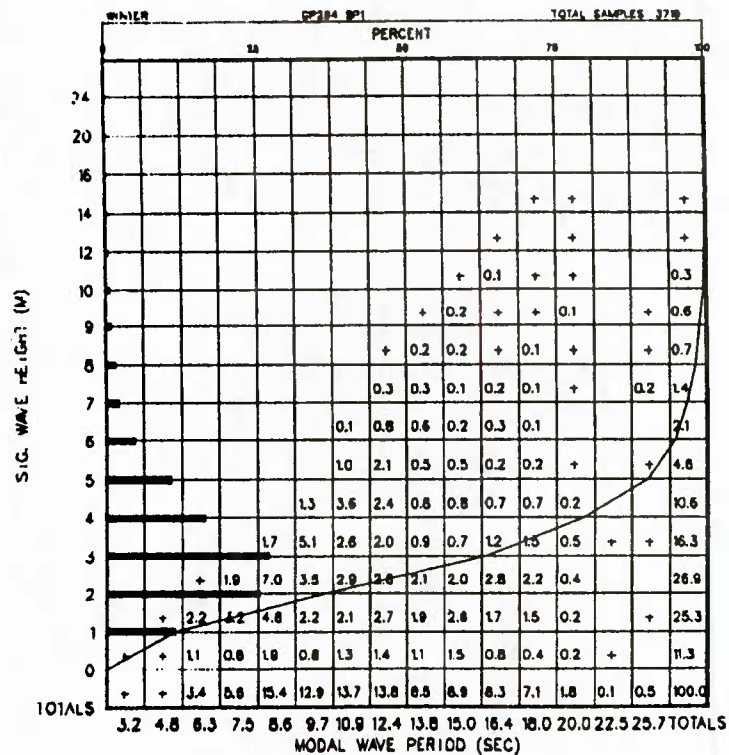


Figure A-294-2-1 Significant Wave Height vs. Modal Wave Period

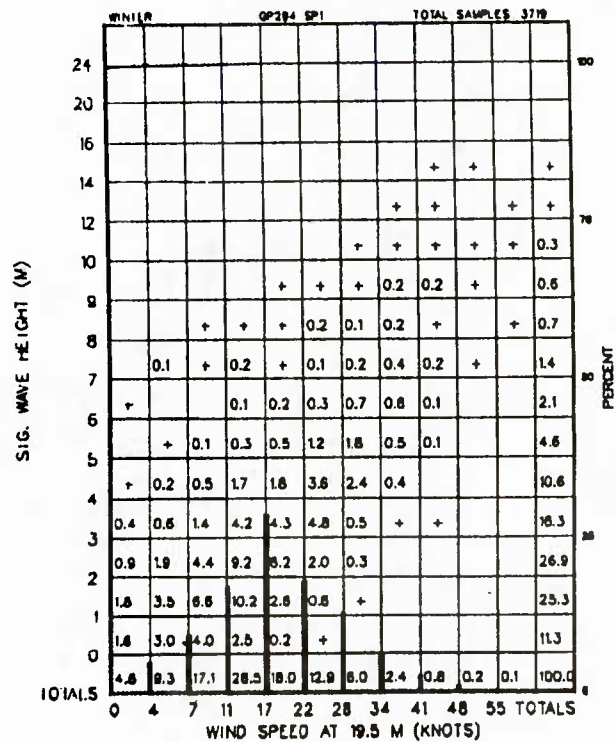


Figure A-294-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

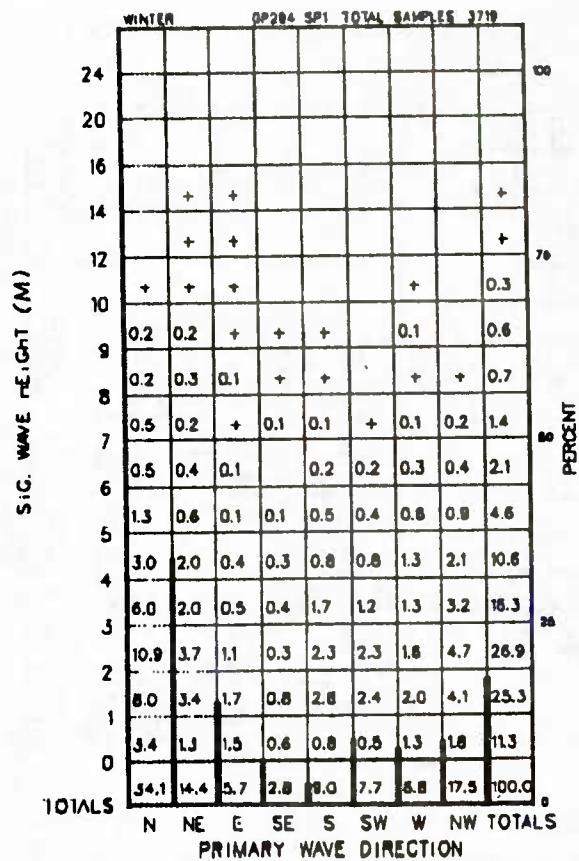


Figure A-294-2-3 Significant Wave Height vs. Primary Wave Direction

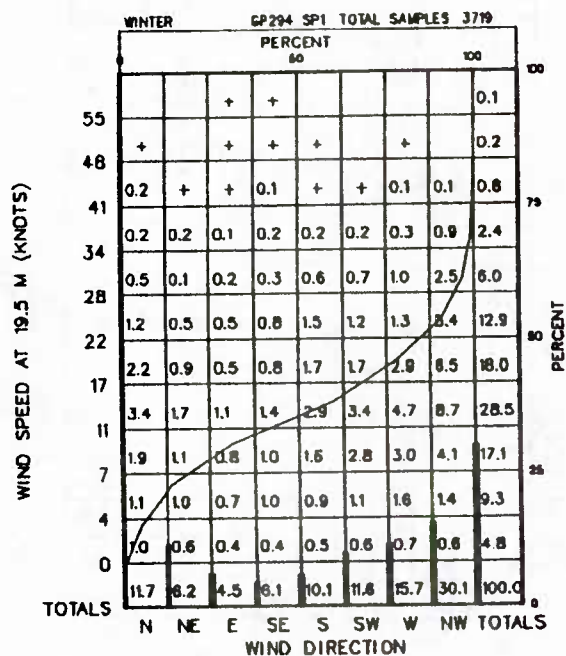


Figure A-294-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

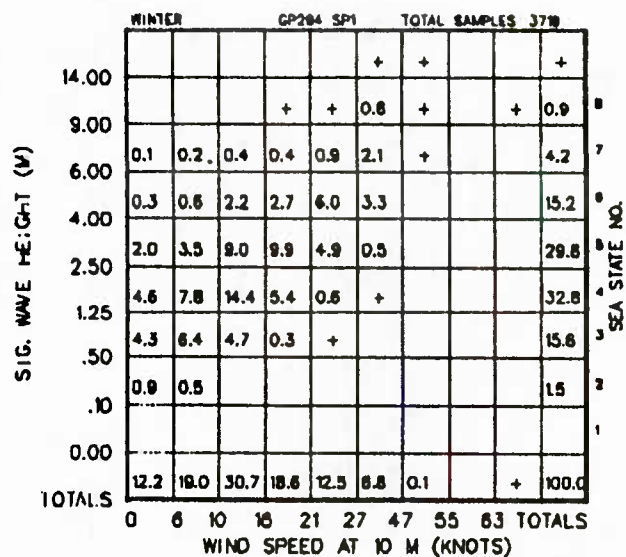


Figure A-294-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

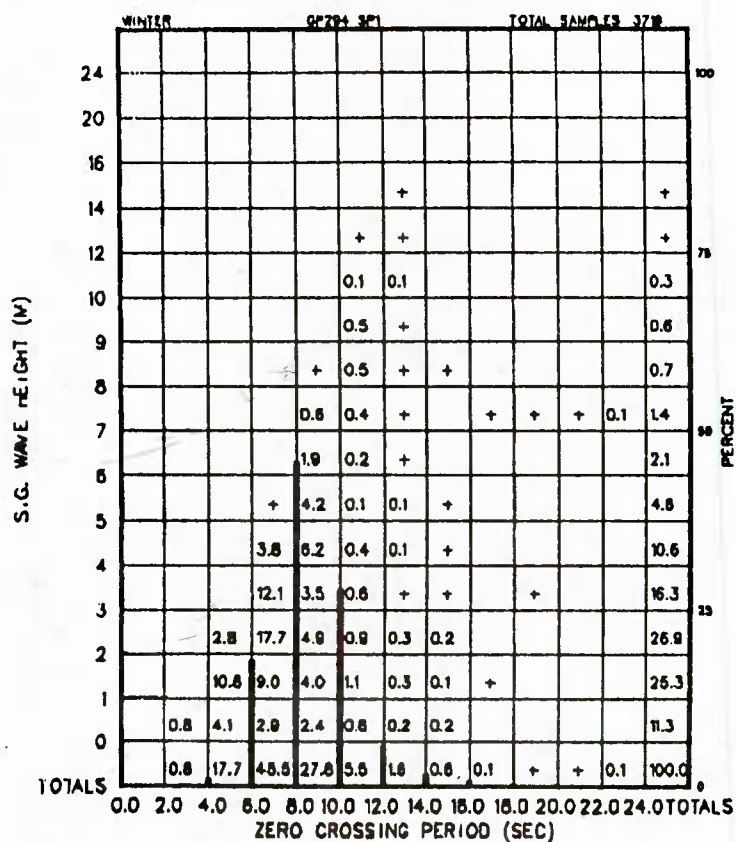


Figure A-294-2-6 Significant Wave Height vs. Zero Crossing Period

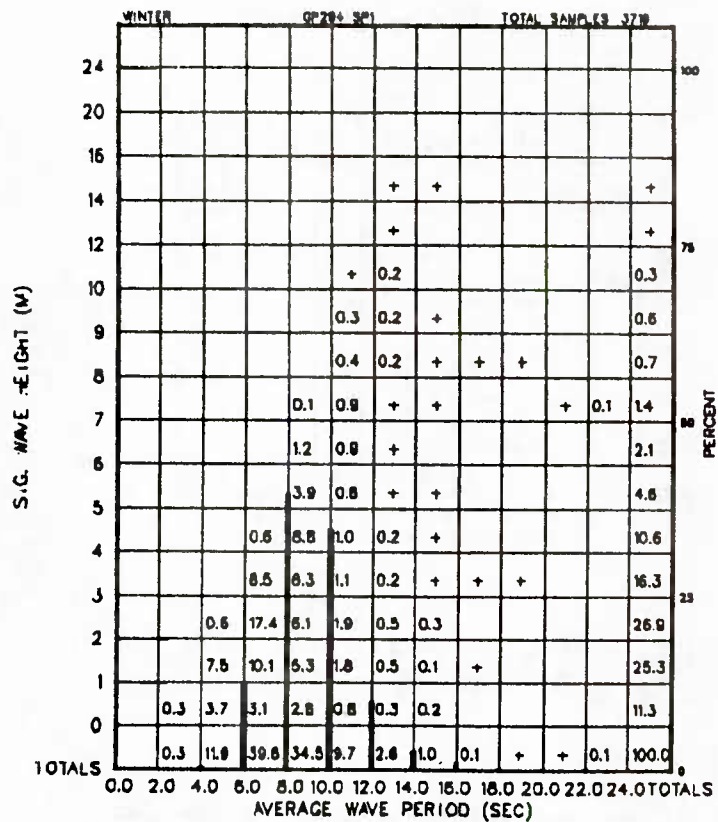


Figure A-294-2-7 Significant Wave Height vs. Average Wave Period

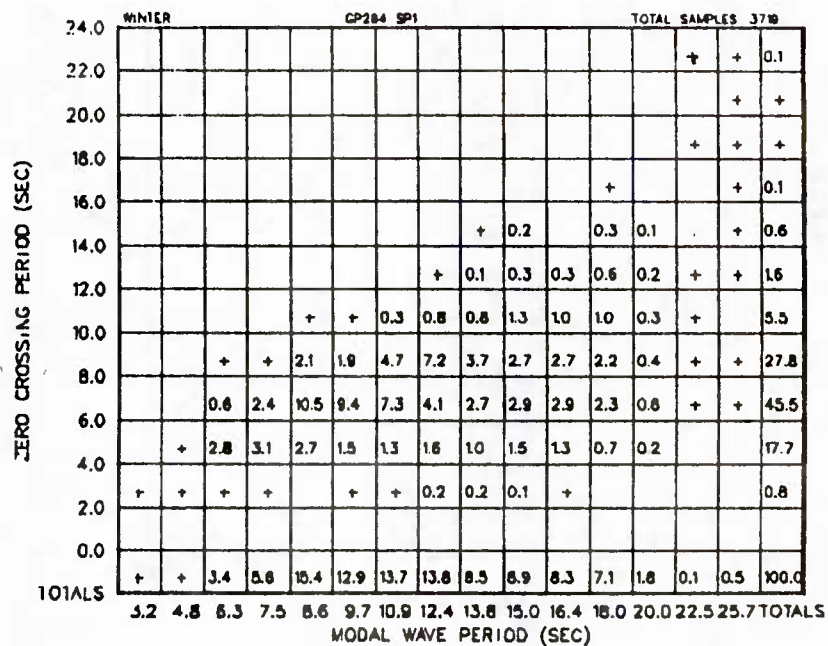


Figure A-294-2-8 Zero Crossing Period vs. Modal Wave Period

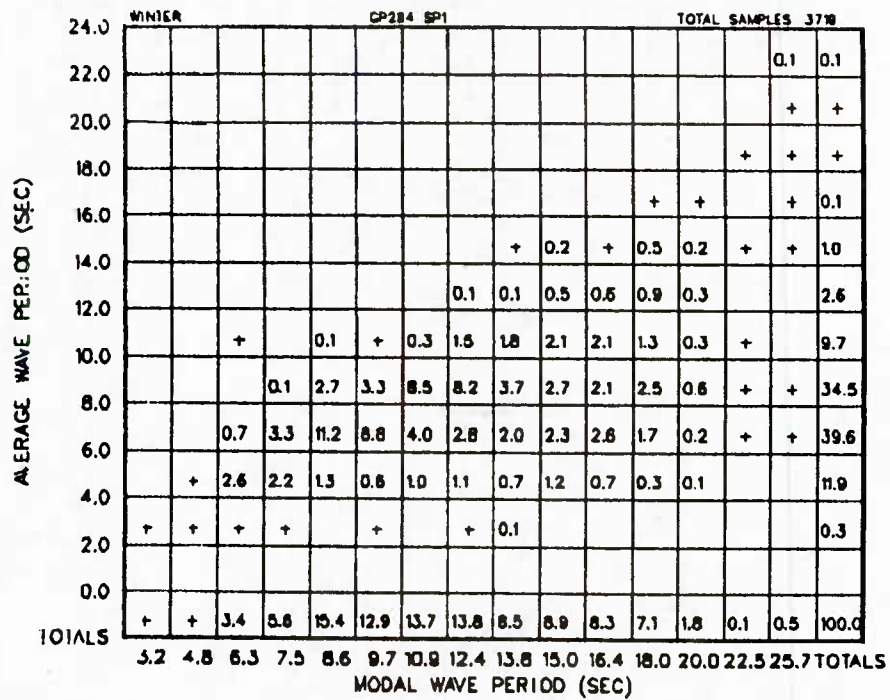


Figure A-294-2-9 Average Wave Period vs.
Modal Wave Period

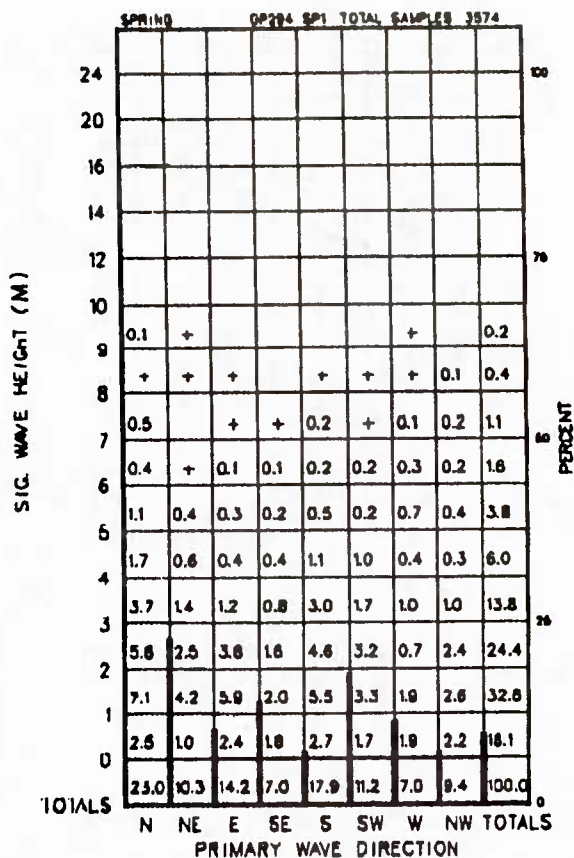


Figure A-294-3-3 Significant Wave Height vs. Primary Wave Direction

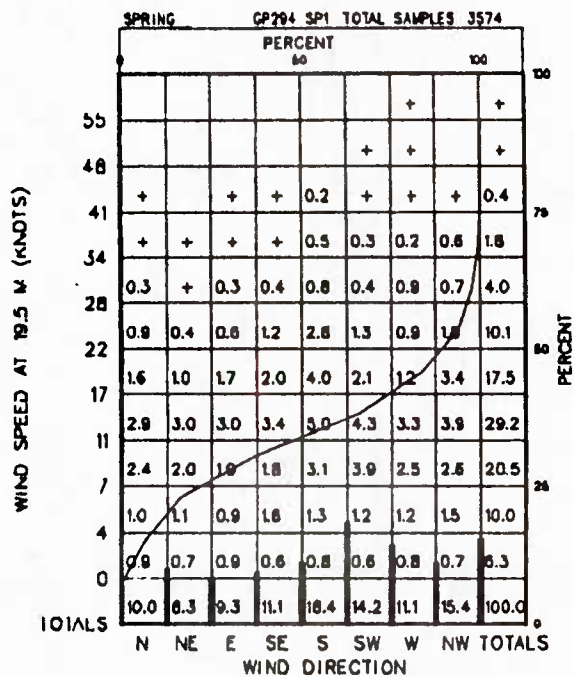


Figure A-294-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

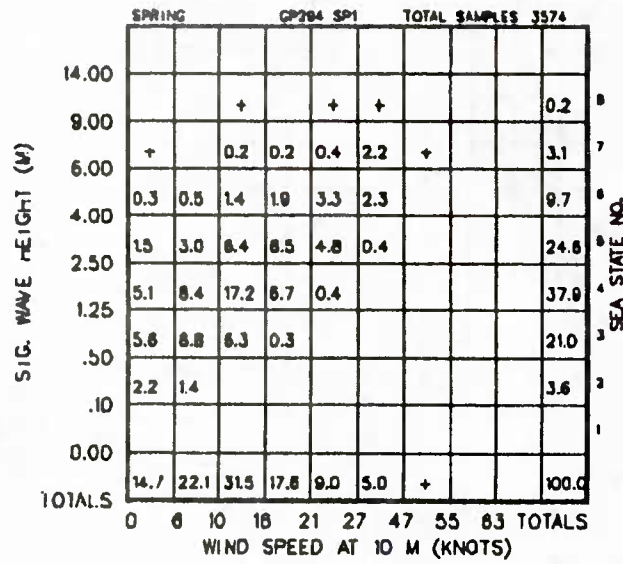


Figure A-294-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

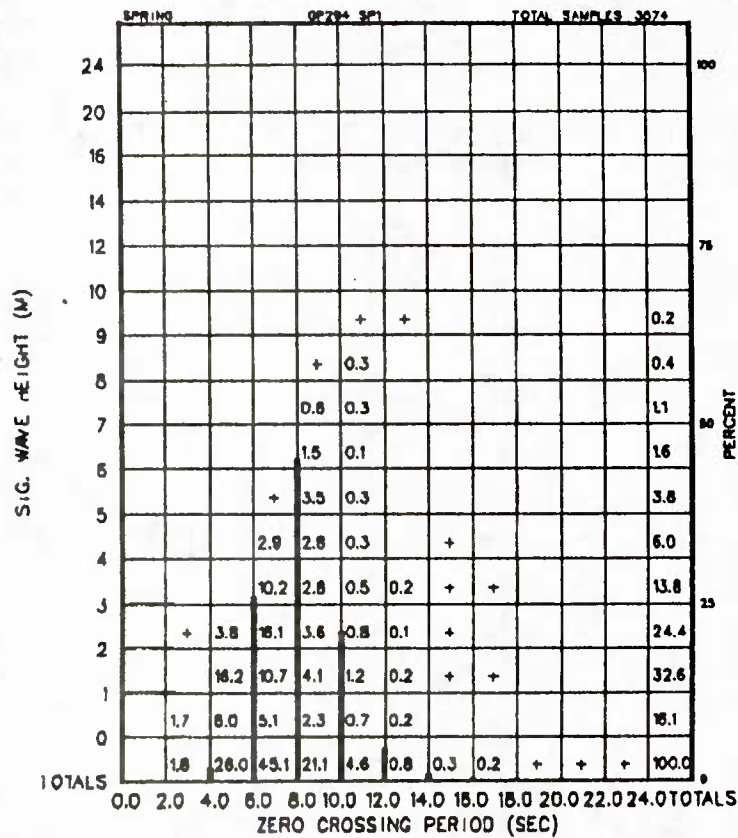


Figure A-294-3-6 Significant Wave Height vs. Zero Crossing Period

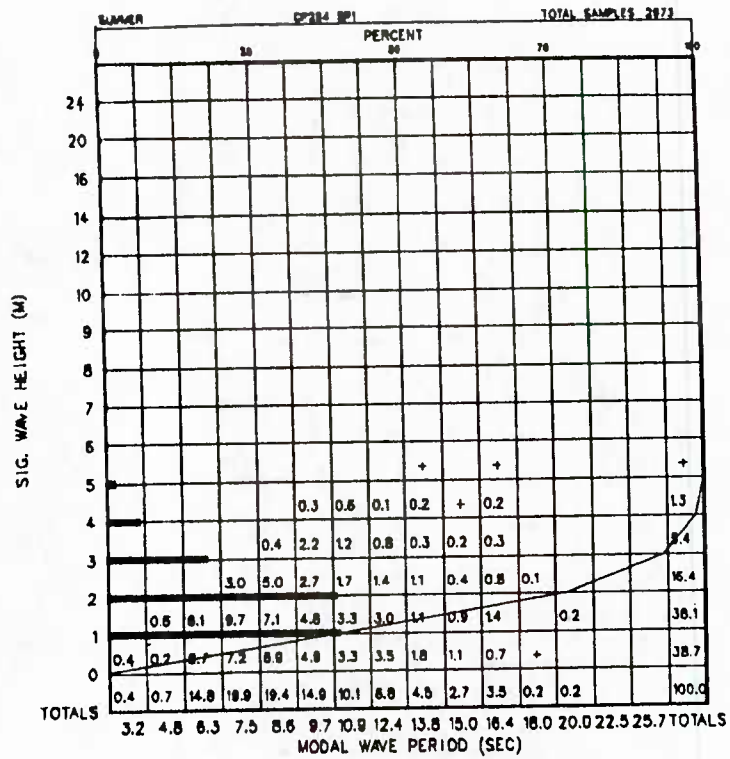


Figure A-294-4-1 Significant Wave Height vs. Modal Wave Period

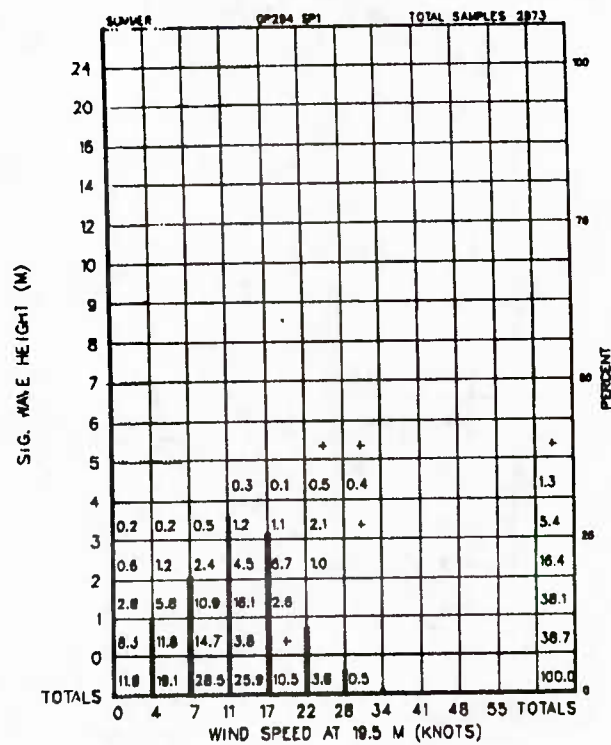


Figure A-294-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

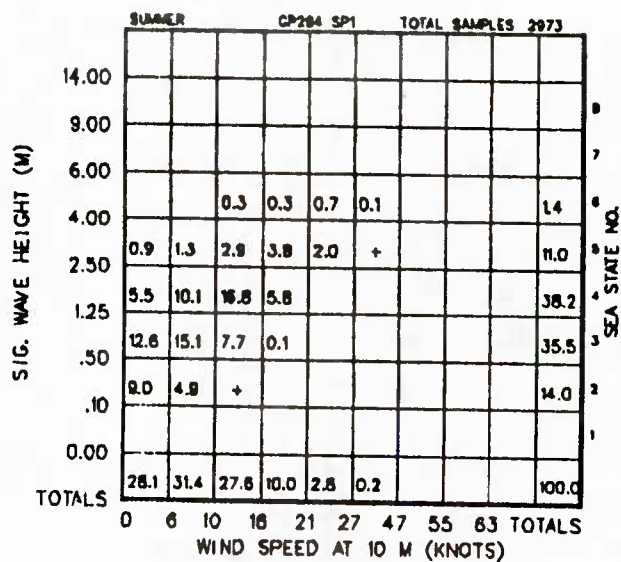


Figure A-294-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

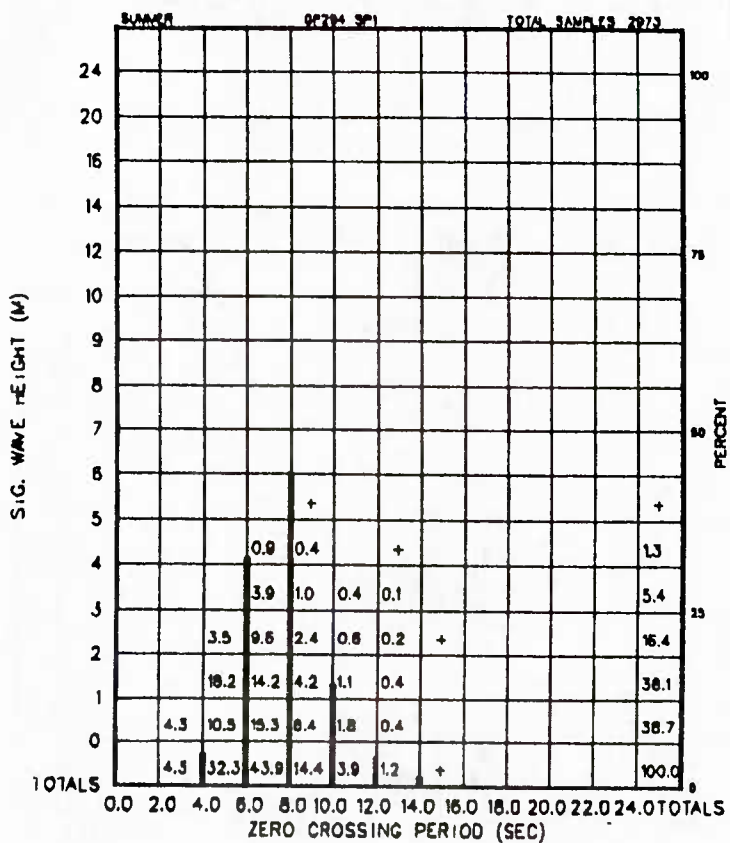


Figure A-294-4-6 Significant Wave Height vs. Zero Crossing Period

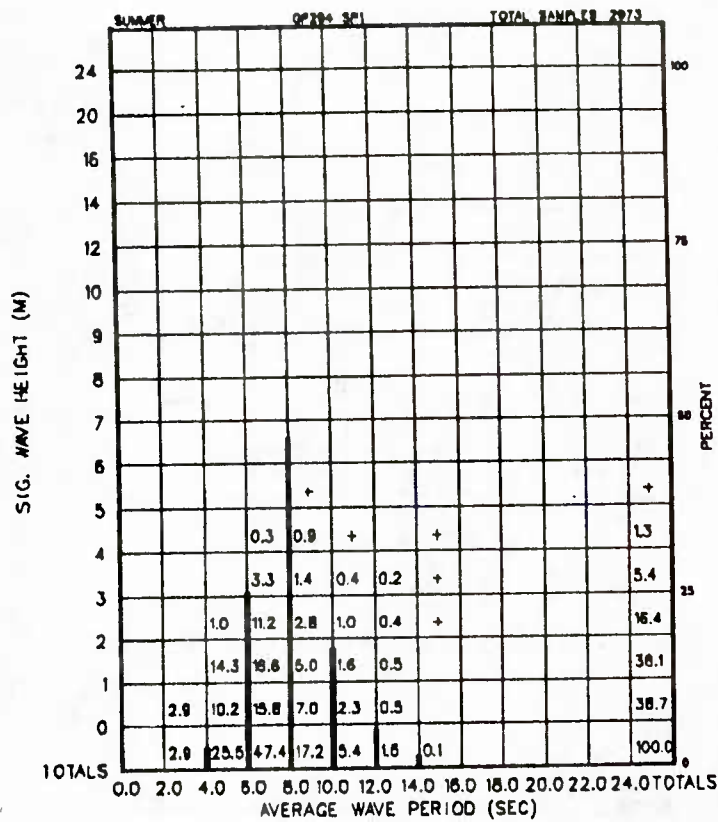


Figure A-294-4-7 Significant Wave Height vs. Average Wave Period

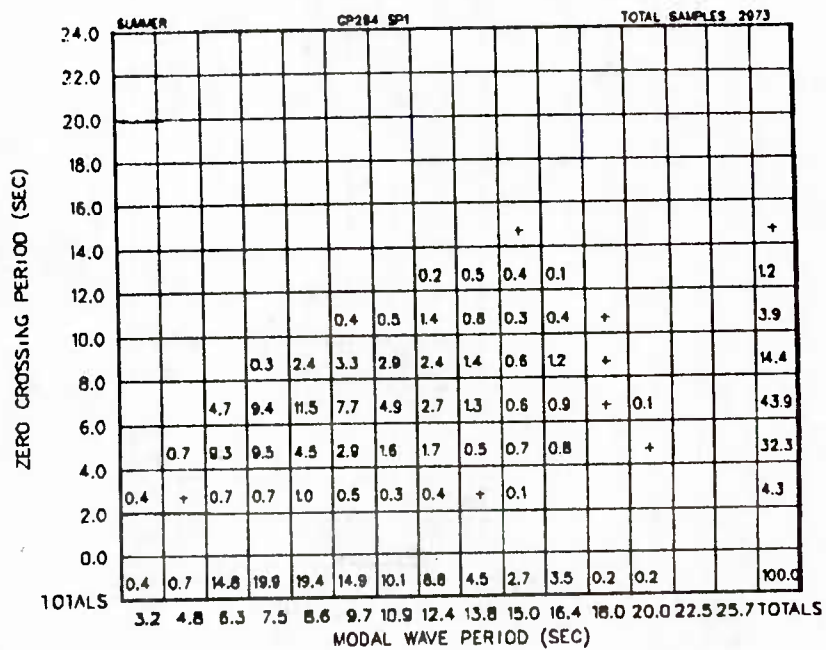


Figure A-294-4-8 Zero Crossing Period vs. Modal Wave Period

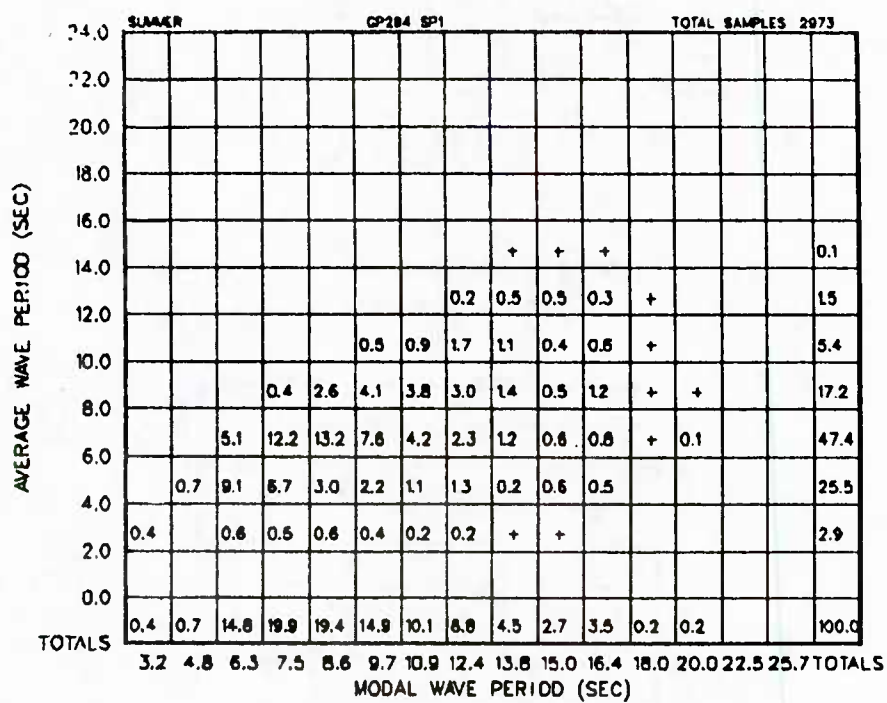


Figure A-294-4-9 Average Wave Period vs.
Modal Wave Period

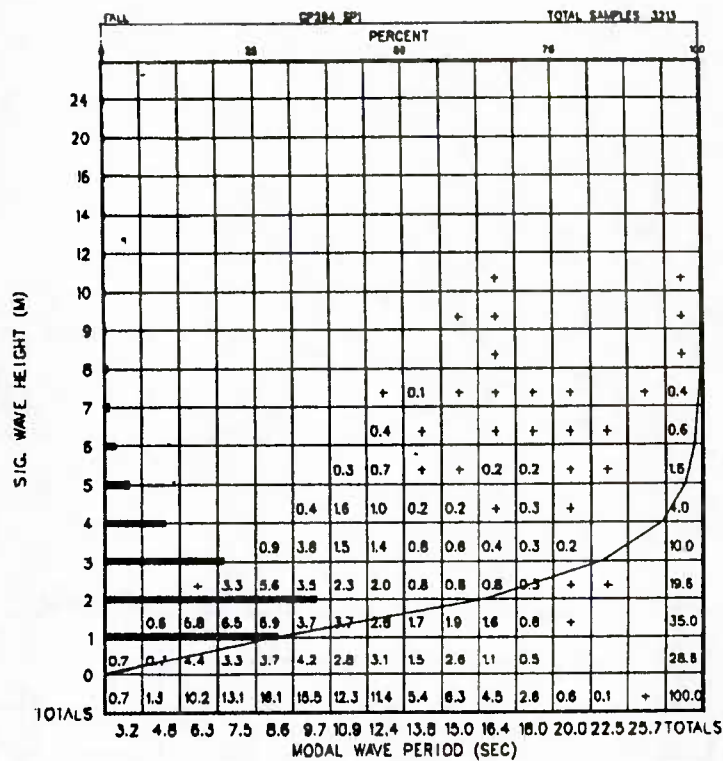


Figure A-294-5-1 Significant Wave Height vs. Modal Wave Period

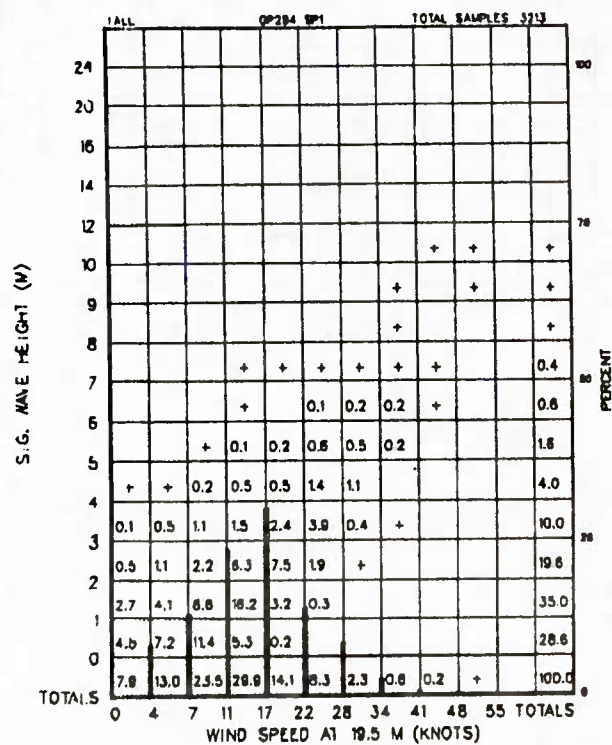


Figure A-294-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

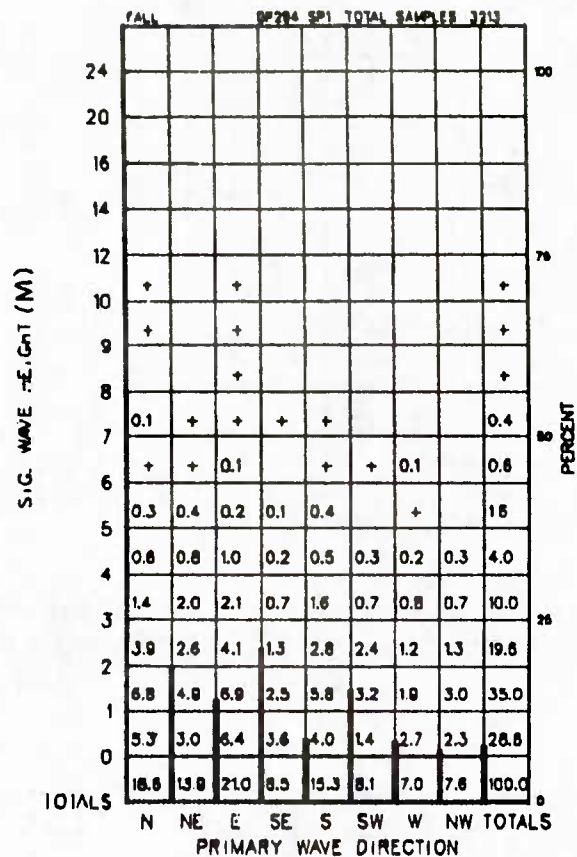


Figure A-294-5-3 Significant Wave Height vs. Primary Wave Direction

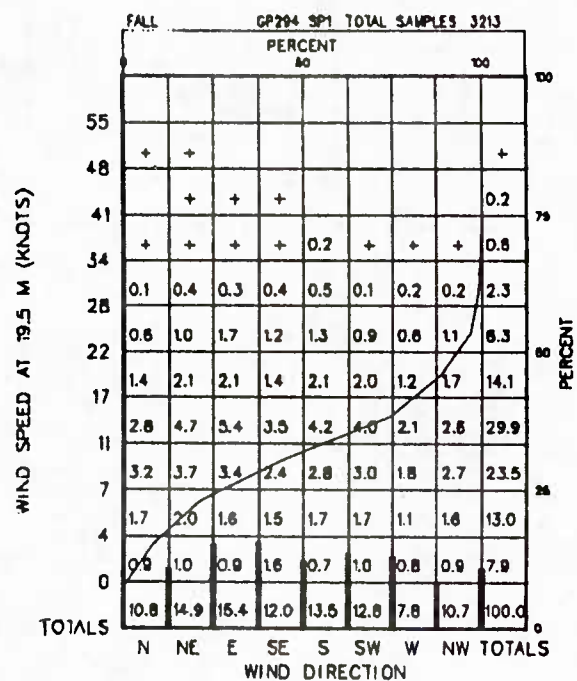


Figure A-294-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

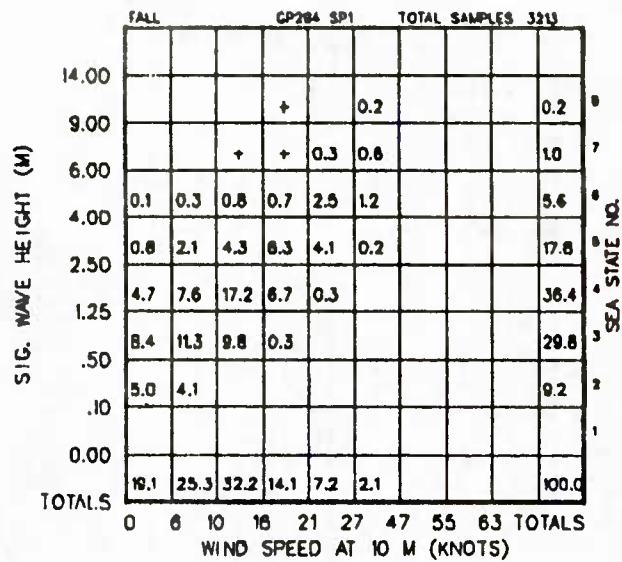


Figure A-294-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

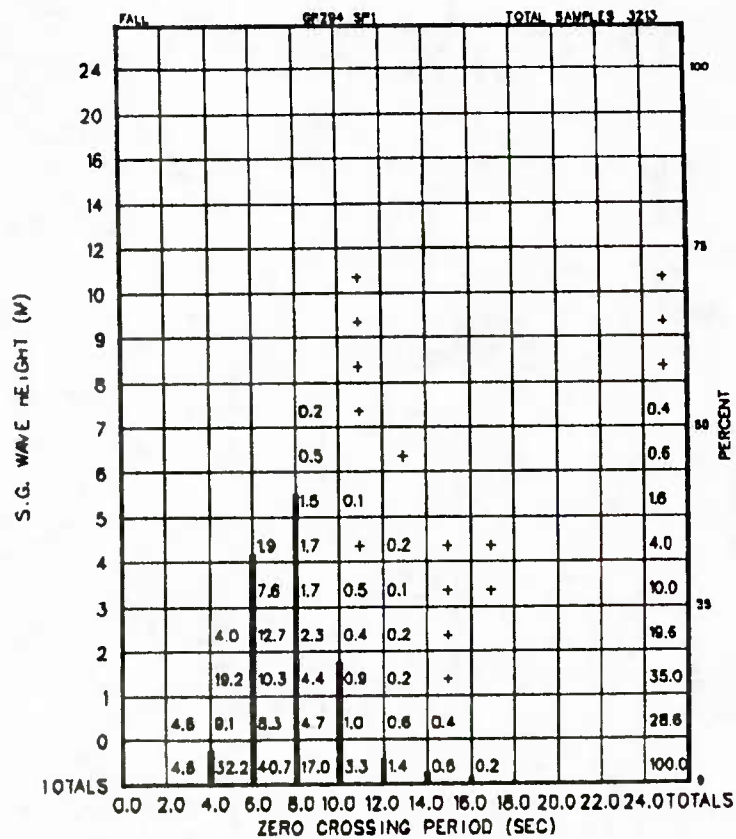


Figure A-294-5-6 Significant Wave Height vs. Zero Crossing Period

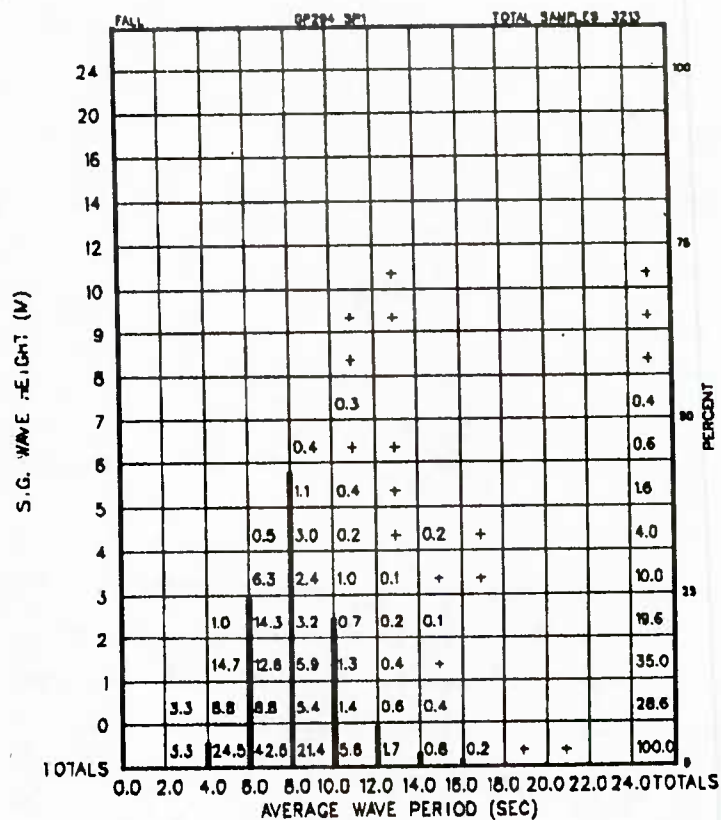


Figure A-294-5-7 Significant Wave Height vs. Average Wave Period

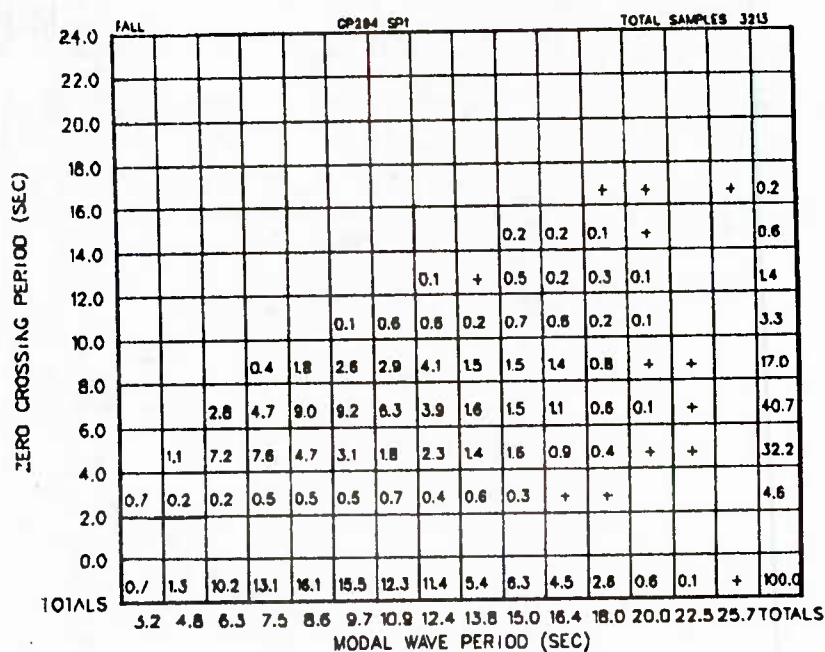


Figure A-294-5-8 Zero Crossing Period vs. Modal Wave Period

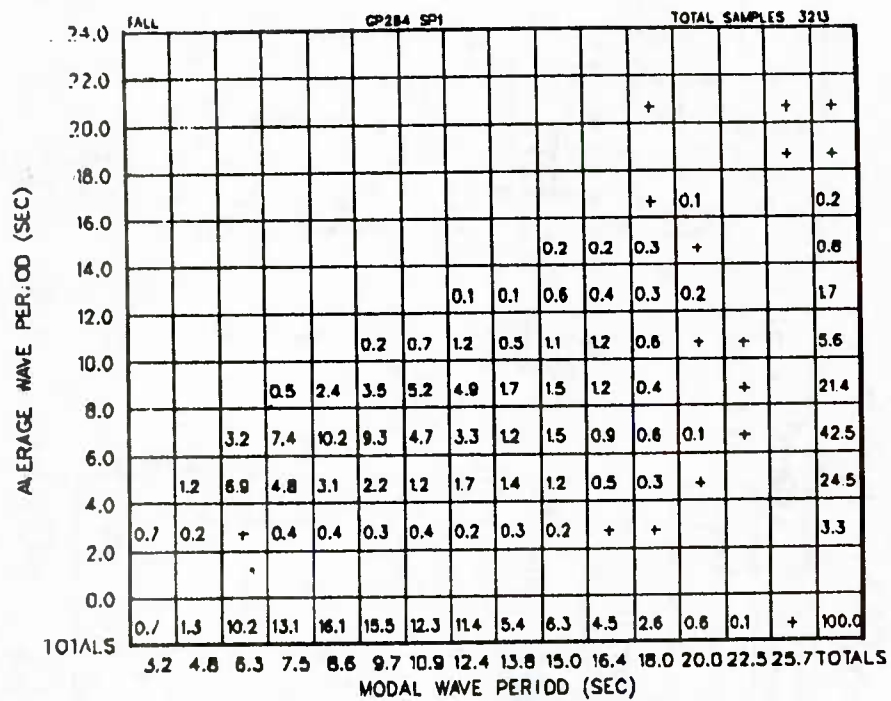


Figure A-294-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-085-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.48°N, 174.21°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	2 11.5 -	6 18.5 -	2.5 12 -	1.5 12.4 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12.5 1.75 -	31 5 -	14 2 -	14 2 SW
Visibility, nautical miles	2	12	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 5.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 12% of the time				
Relative Humidity, %	58	80	98	-	-
Air Temperature, °C	12.5	16	19.5	16	-
Sea Surface Temperature, °C	14.5	18.5	21.5	-	-
Sea Level Pressure, millibars	1002	1020	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	248 - -	- 1% 1%

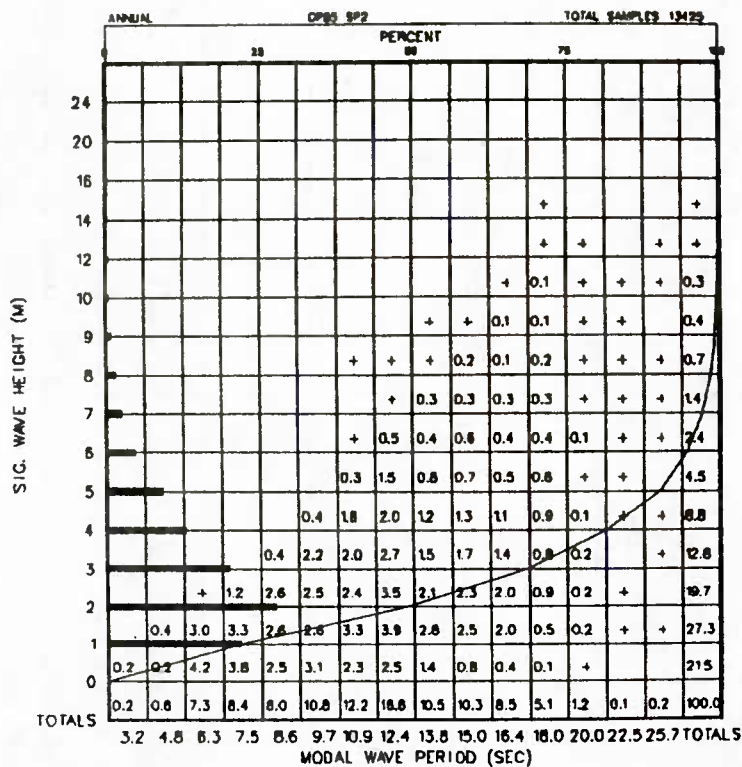


Figure A-085-1-1 Significant Wave Height vs. Modal Wave Period

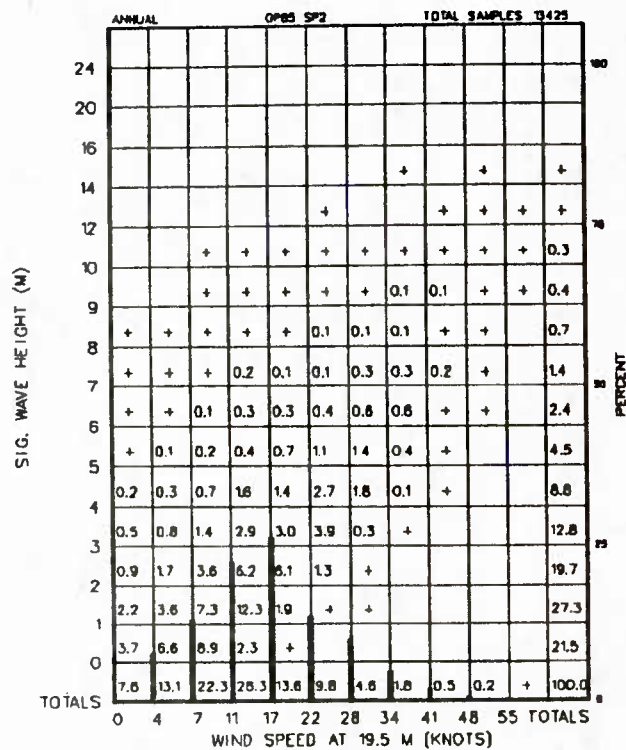


Figure A-085-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

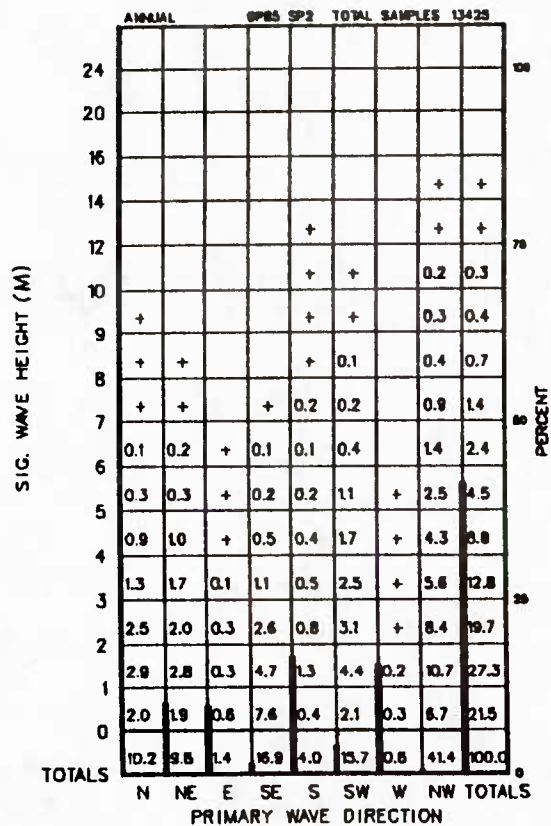


Figure A-085-1-3 Significant Wave Height vs. Primary Wave Direction

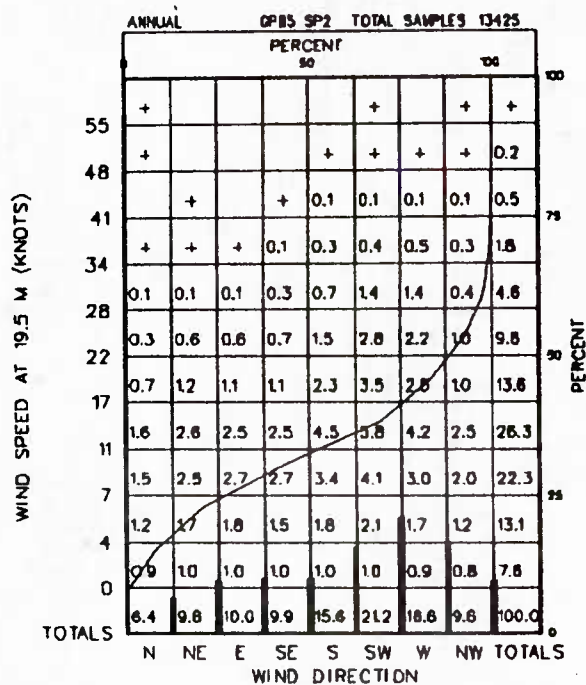
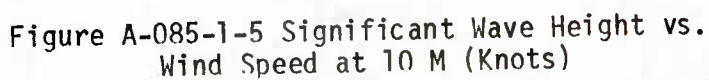
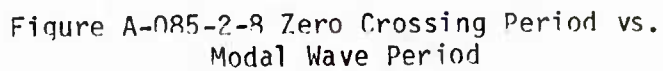
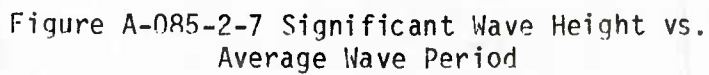


Figure A-085-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



ANNUAL		CP85 SP2																TOTAL SAMPLES 13425																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
WIND SPEED AT 19.5 M (KNOTS)	55	48	41	34	28	22	17	11	7	4	0	TOTALS	PERCENT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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Figure A-085-1-11 Persistence of Wind Speed
at 19.5 M (Knots)



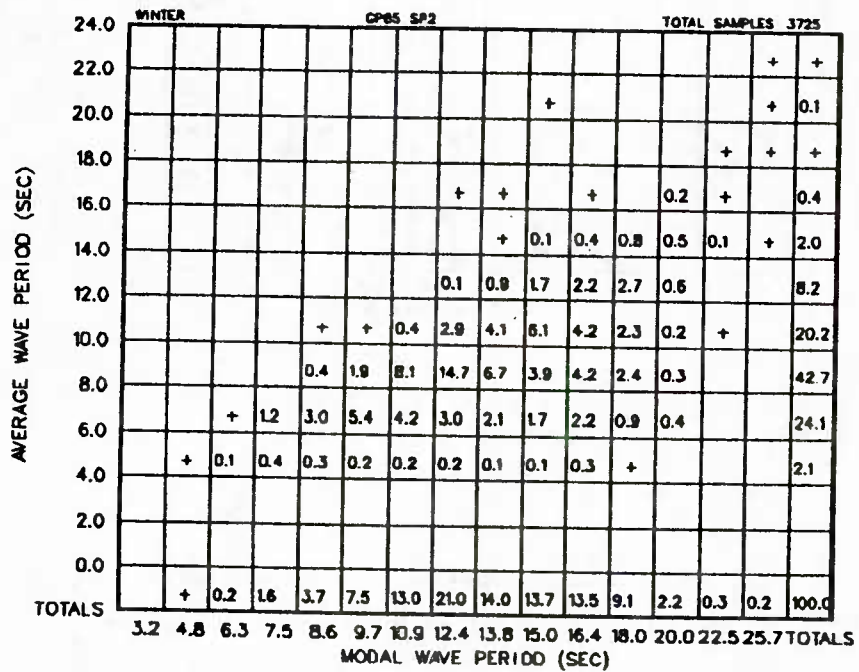


Figure A-085-2-9 Average Wave Period vs.
Modal Wave Period

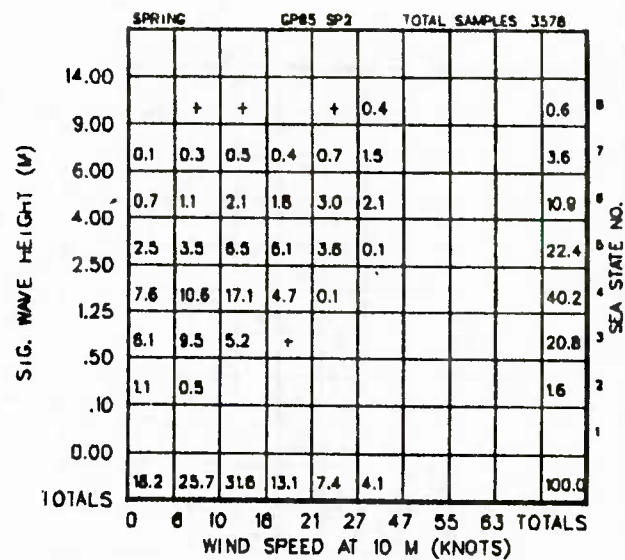


Figure A-085-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

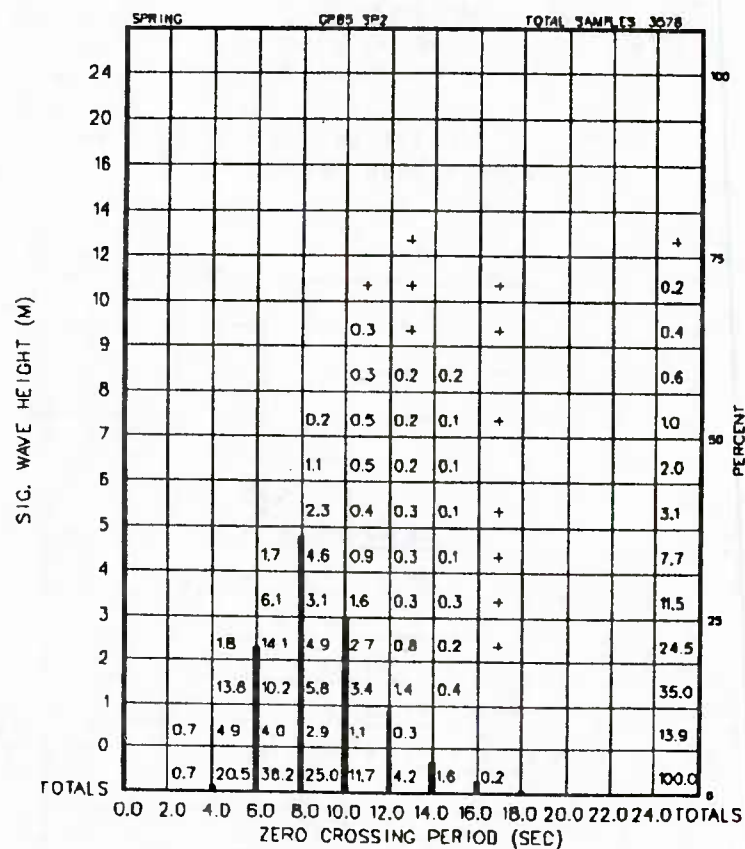


Figure A-085-3-6 Significant Wave Height vs. Zero Crossing Period

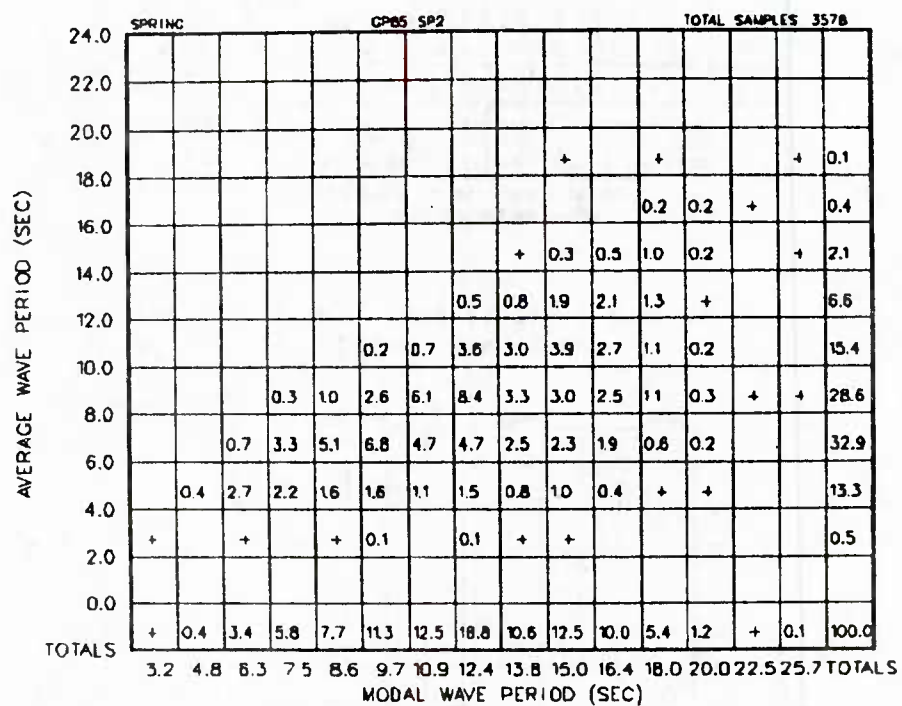


Figure A-085-3-9 Average Wave Period vs.
Modal Wave Period

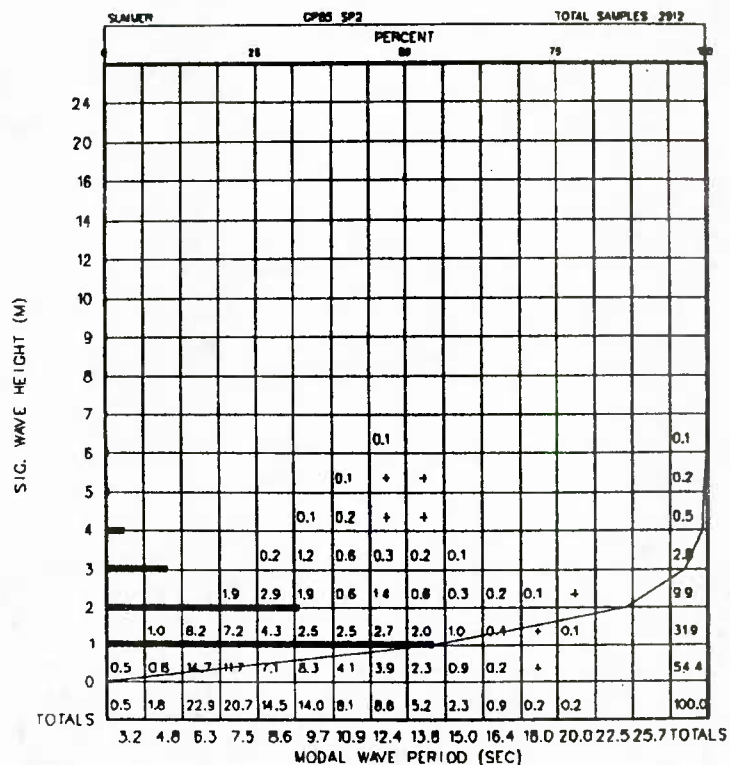


Figure A-085-4-1 Significant Wave Height vs. Modal Wave Period

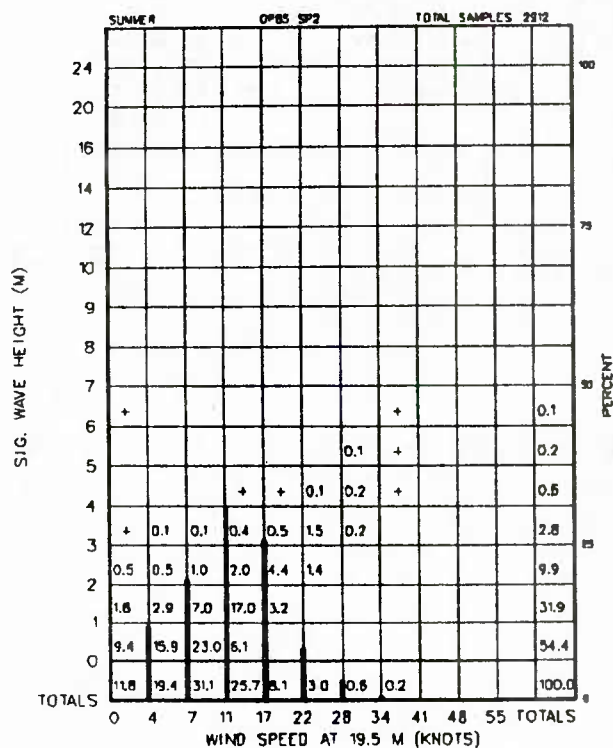


Figure A-085-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

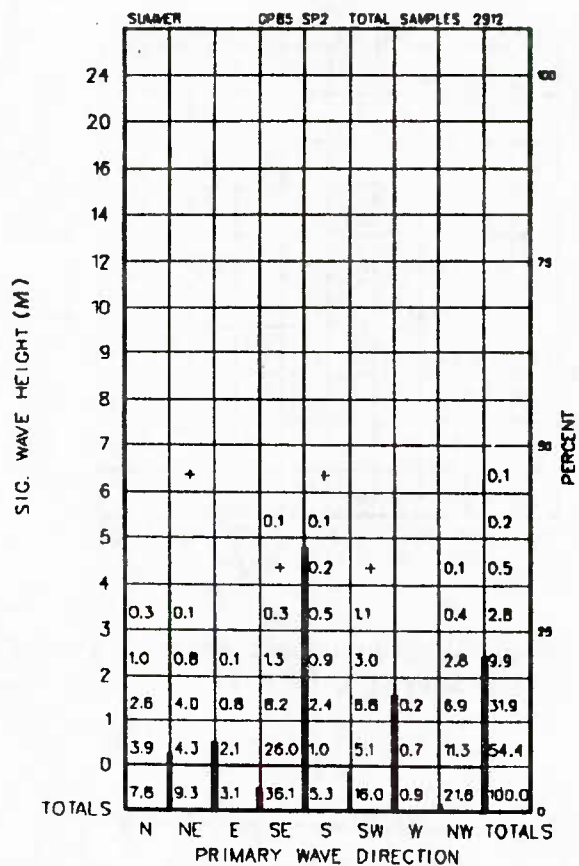


Figure A-085-4-3 Significant Wave Height vs. Primary Wave Direction

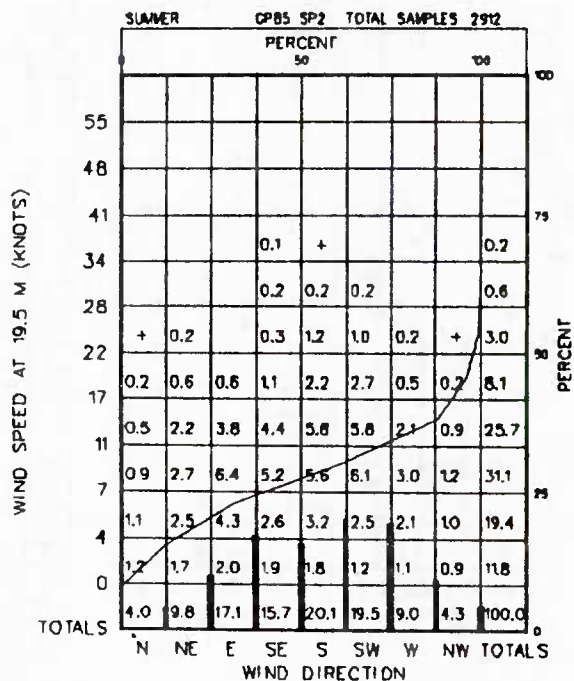


Figure A-085-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

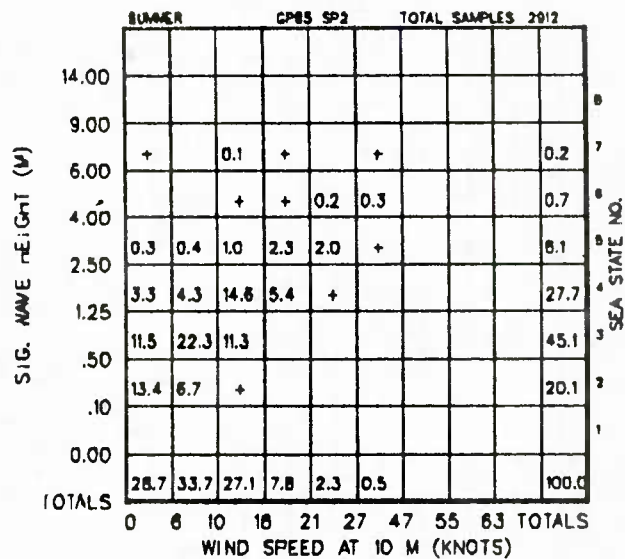


Figure A-085-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

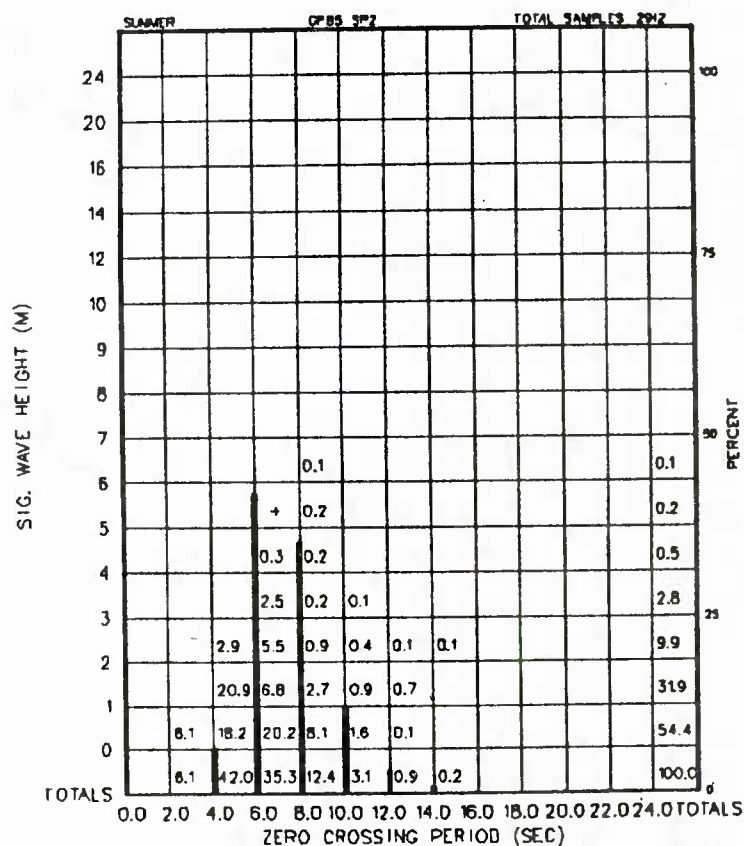


Figure A-085-4-6 Significant Wave Height vs. Zero Crossing Period

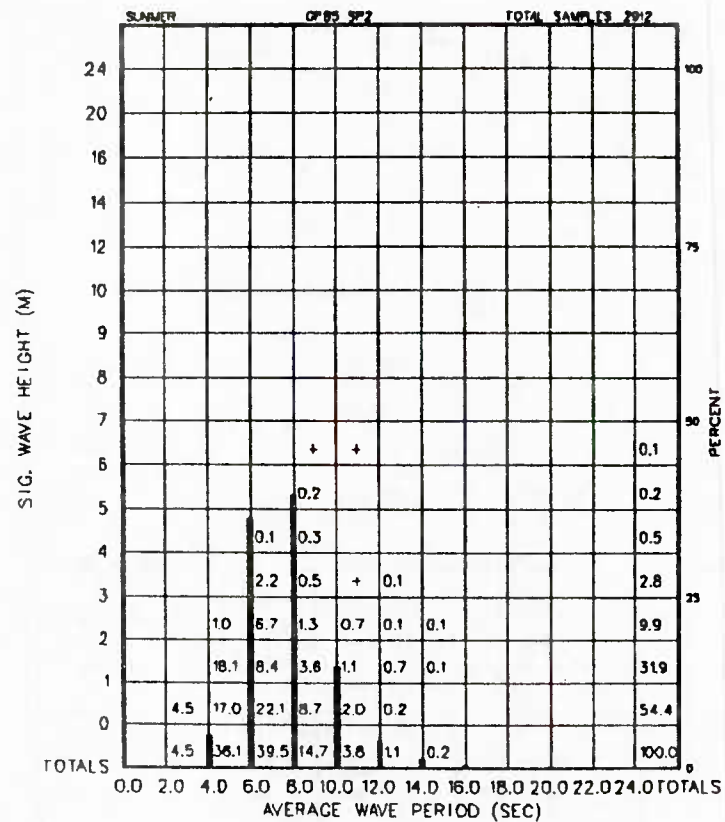


Figure A-085-4-7 Significant Wave Height vs. Average Wave Period

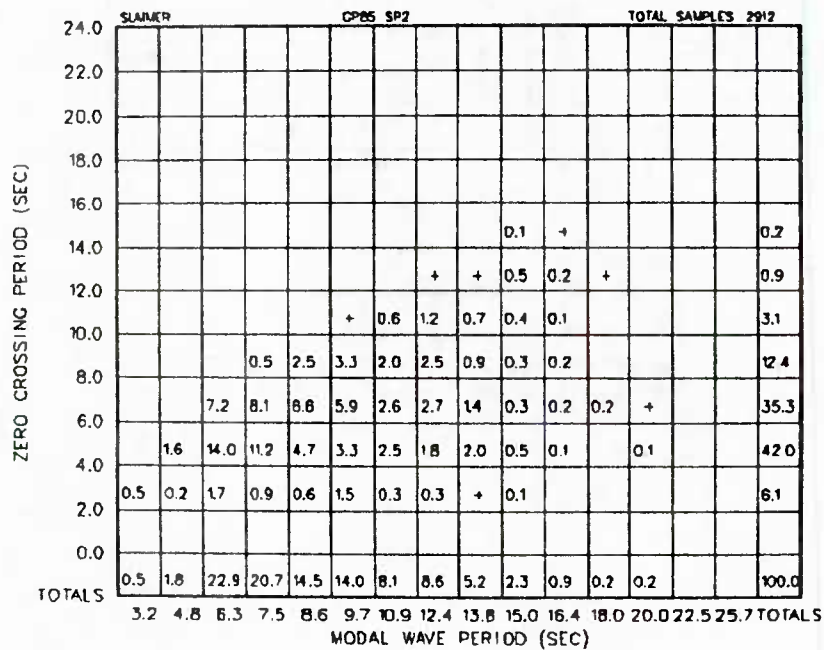
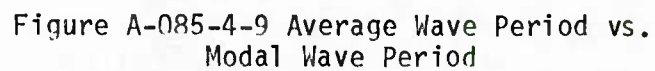


Figure A-085-4-8 Zero Crossing Period vs. Modal Wave Period



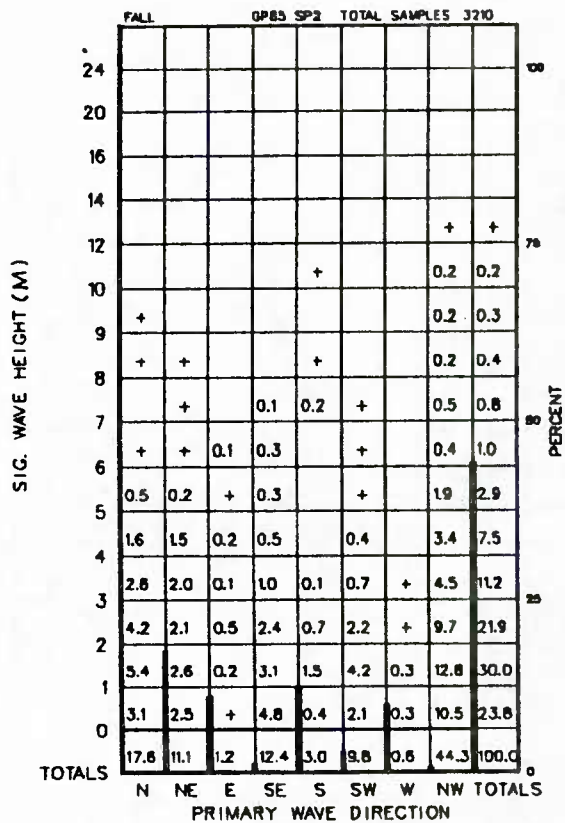


Figure A-085-5-3 Significant Wave Height vs. Primary Wave Direction

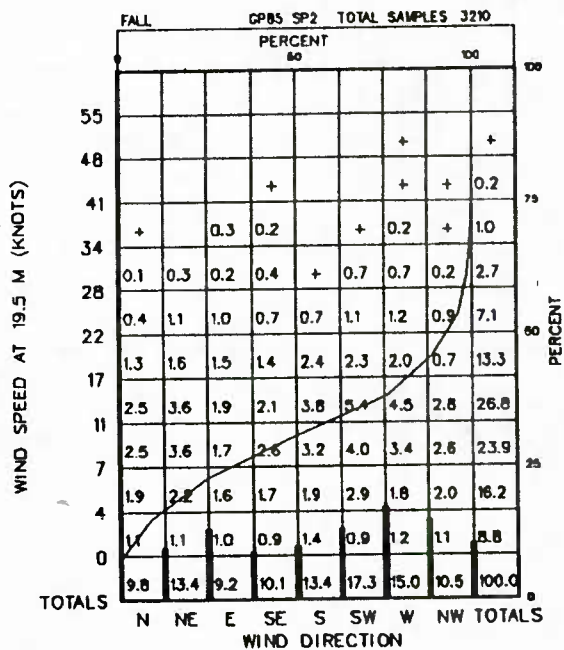


Figure A-085-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

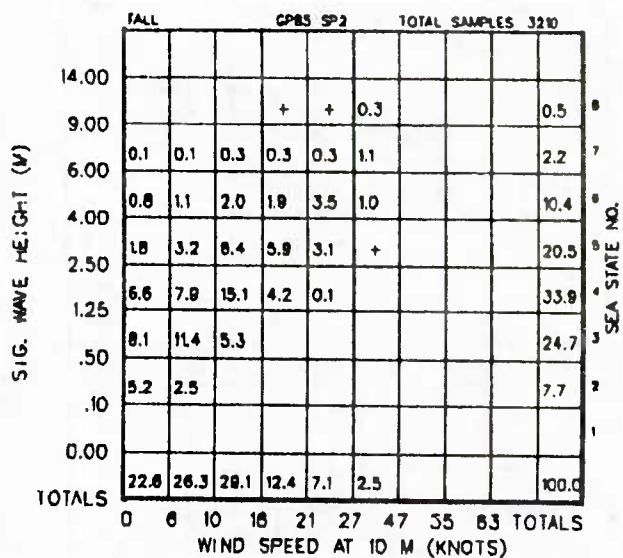


Figure A-085-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

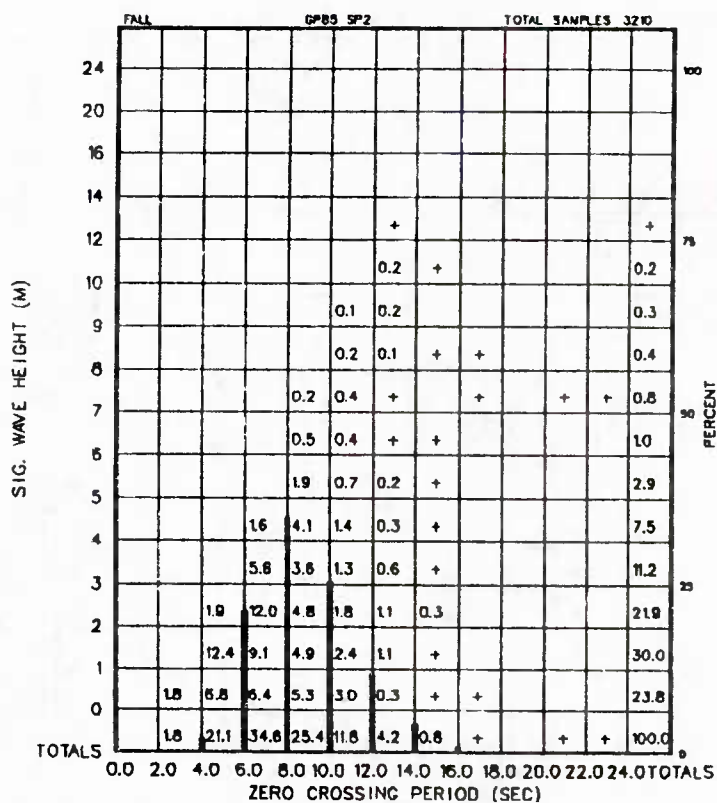


Figure A-085-5-6 Significant Wave Height vs. Zero Crossing Period

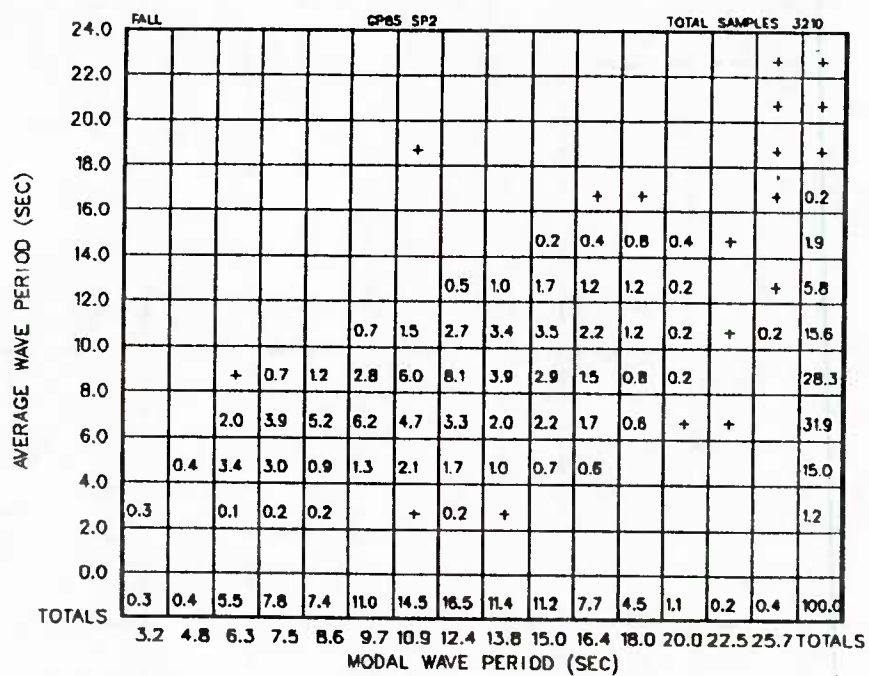


Figure A-085-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-2/093-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 42.81°N, 159.01°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	3 11.5 -	8 16.5 -	3.5 11.5 -	1.5 12.4 W-S
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 0.75 -	16.5 2.5 -	40 7 -	18.5 3 -	14 2 W-NW
Visibility, nautical miles	0.5	7	25	-	-
Cloud Cover Total clouds, in eighths of sky obscured Low clouds, in eighths of sky obscured	0 0	7.5 7	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 23% of the time Snow - 22% of the time (Dec-Mar)				
Relative Humidity, %	72	90	98	-	-
Air Temperature, °C	1	3	6	3.5	-
Sea Surface Temperature, °C	3.5	6	12	-	-
Sea Level Pressure, millibars	982	1008	1025	-	-
Ice	Moderate* superstructure icing - 1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	352 - -	- 1% 2%

*Buildup of less than 1/10 in. per hour (derived from observations with temperature < -2.2°C and wind speed > 13 knots).

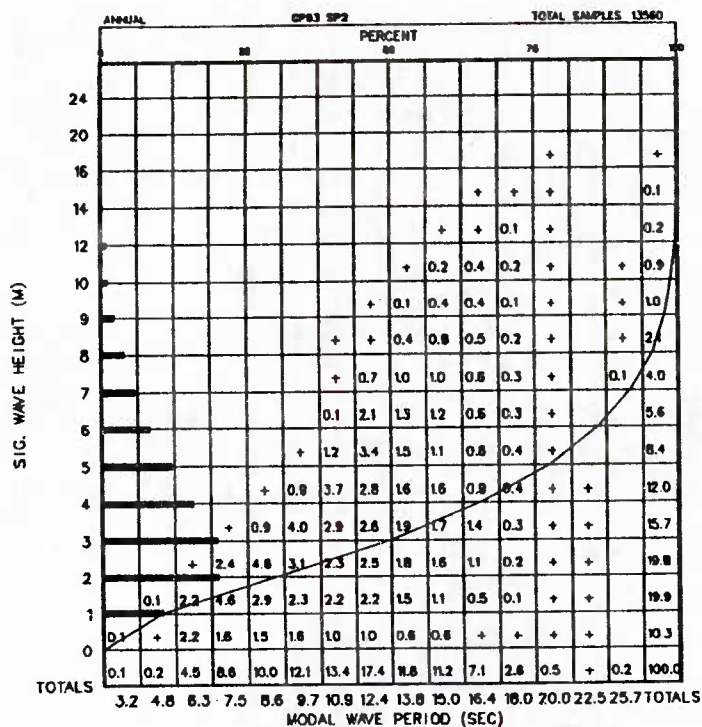


Figure A-2/093-1-1 Significant Wave Height vs. Modal Wave Period

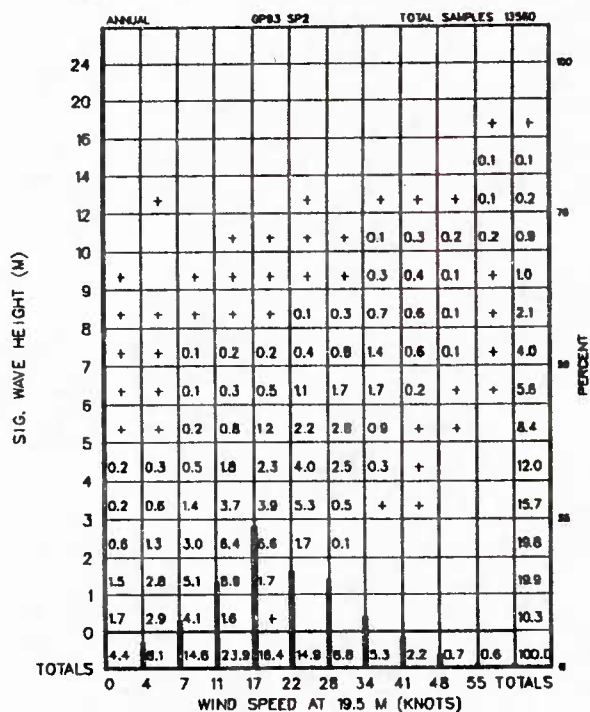


Figure A-2/093-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

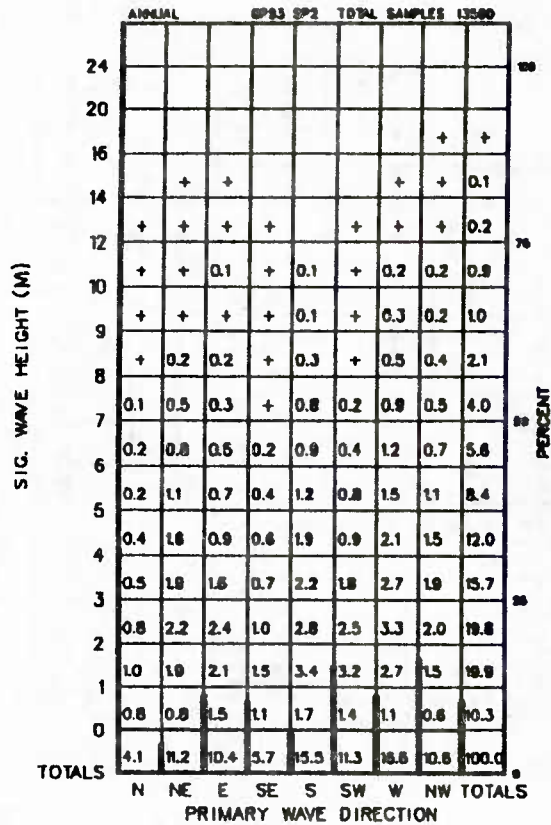


Figure A-2/093-1-3 Significant Wave Height vs. Primary Wave Direction

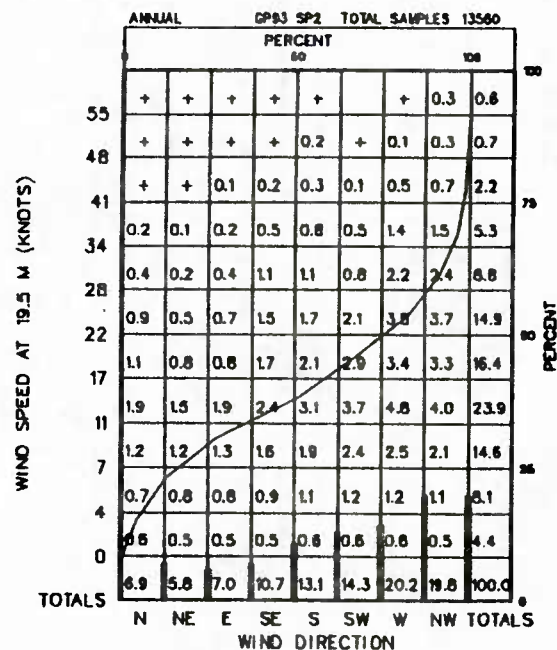


Figure A-2/093-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

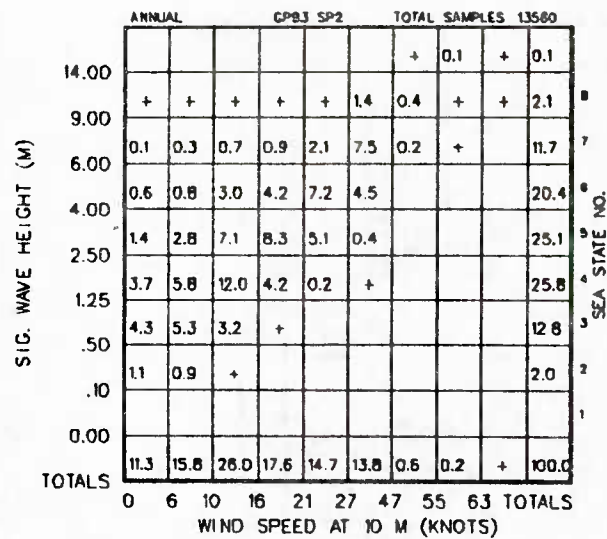


Figure A-2/093-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

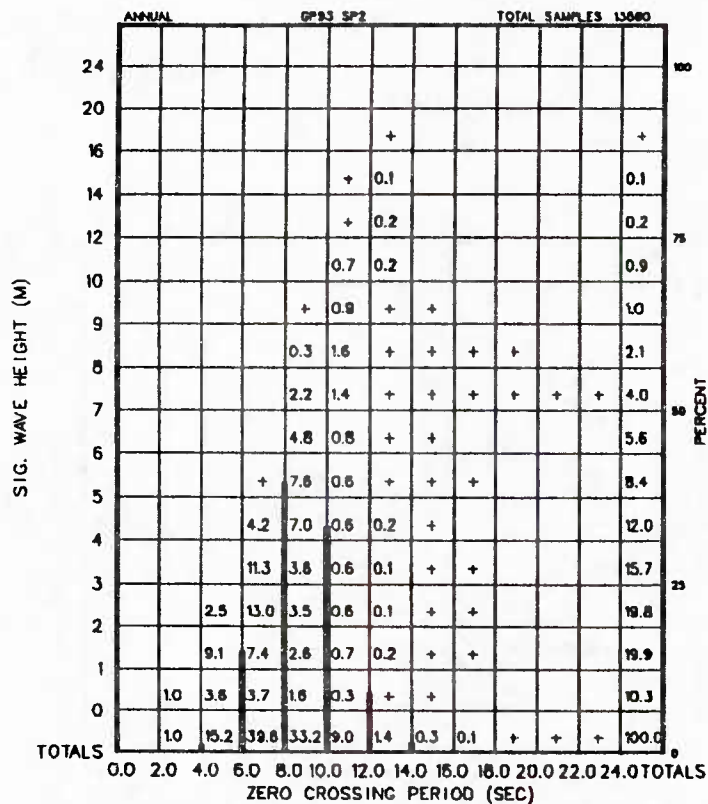


Figure A-2/093-1-6 Significant Wave Height vs. Zero Crossing Period

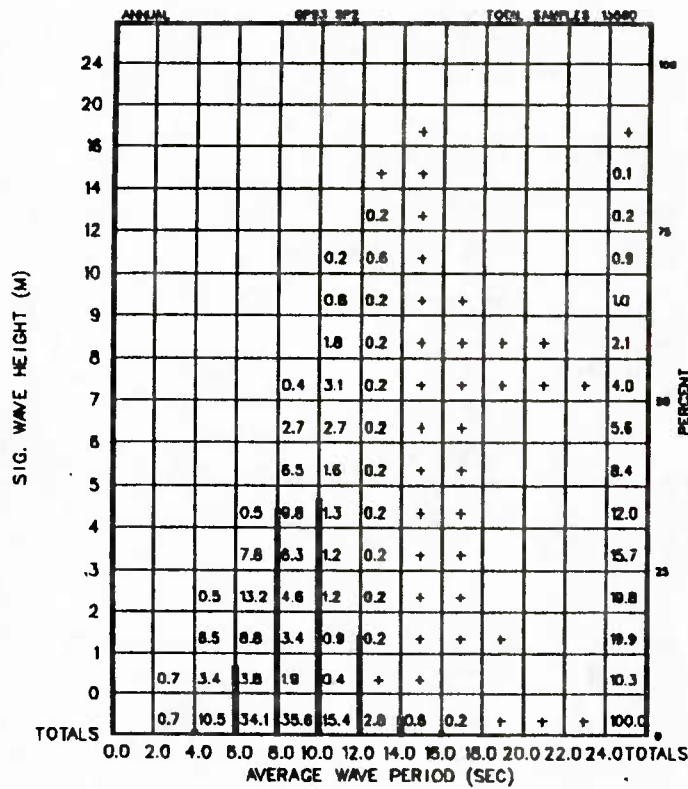


Figure A-2/093-1-7 Significant Wave Height vs. Average Wave Period

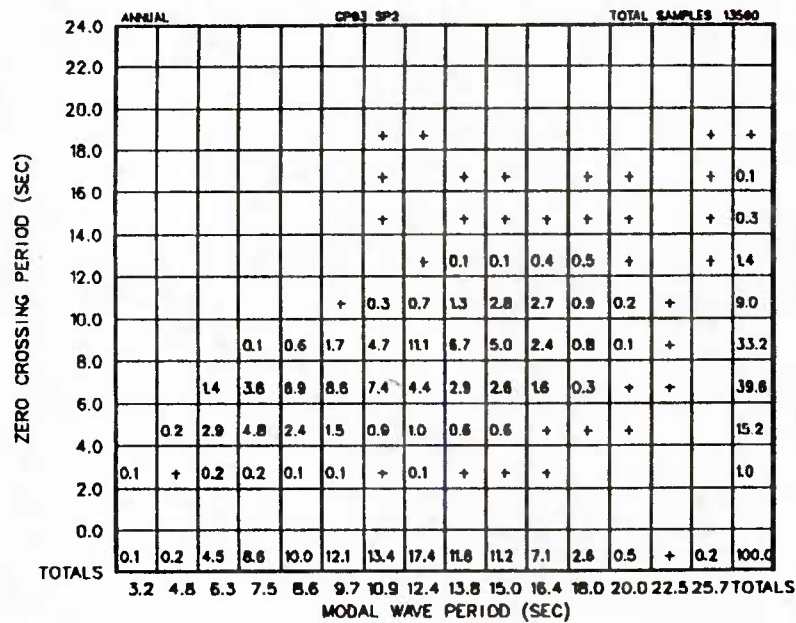
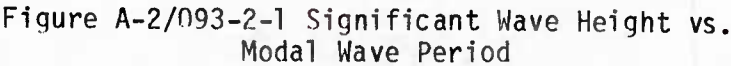


Figure A-2/093-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		093 SP2												TOTAL SAMPLES 13569												PERCENT
WIND SPEED AT 19.5 M (KNOTS)																										
55	24	4	8	2	1		1																		40	
48	66	16	1																						83	
41	128	63	9	2	3																				205	
34	297	121	39	13	2		1																		473	
28	550	163	53	23	3	5	1		1																799	
22	810	282	85	42	19	8	2	1	1		1	1		1	1										1261	
17	1005	280	103	45	17	8	4	1	1	1															1463	
11	1036	400	171	87	36	28	9	8	1	1	1	2													1782	
7	845	243	91	37	21	8	4	1	1	2	1														1254	
4	510	150	45	12	14	1	1	1	1																735	
0	263	73	27	10	3	3	3	2																	384	
TOTALS	5534	1795	642	273	121	57	28	14	8	4	3	3		1											8479	
	D	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS				

Figure A-2/093-1-11 Persistence of Wind Speed
at 19.5 M (Knots)



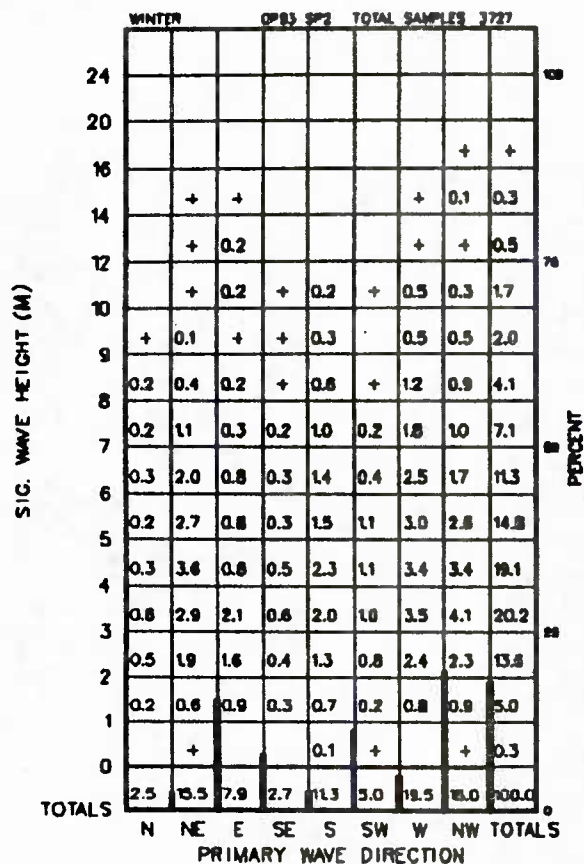


Figure A-2/093-2-3 Significant Wave Height vs. Primary Wave Direction

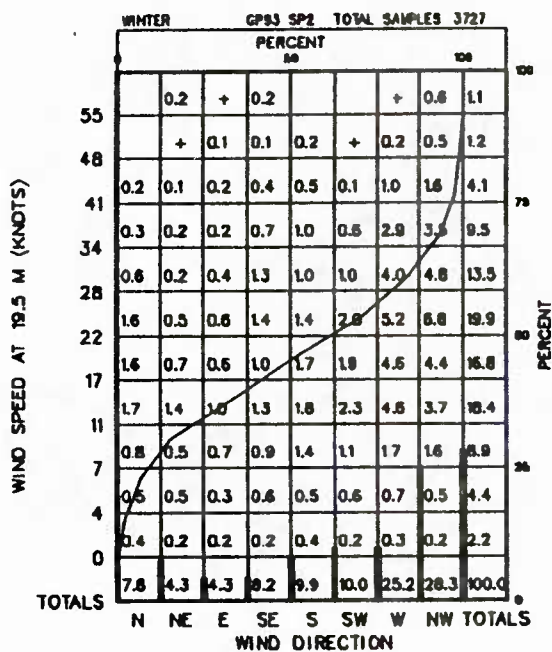


Figure A-2/093-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

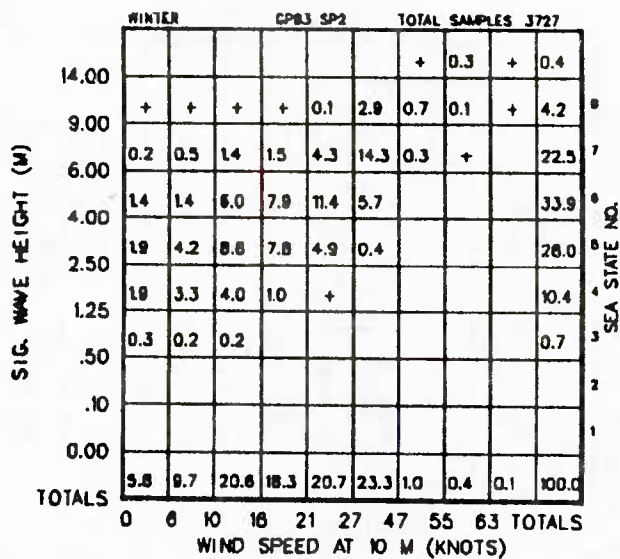


Figure A-2/093-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

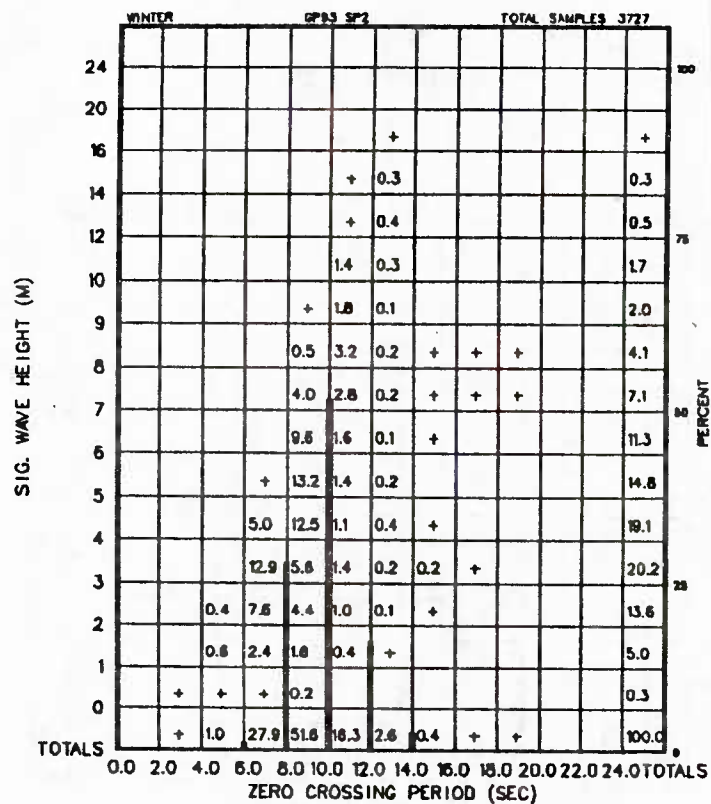


Figure A-2/093-2-6 Significant Wave Height vs. Zero Crossing Period

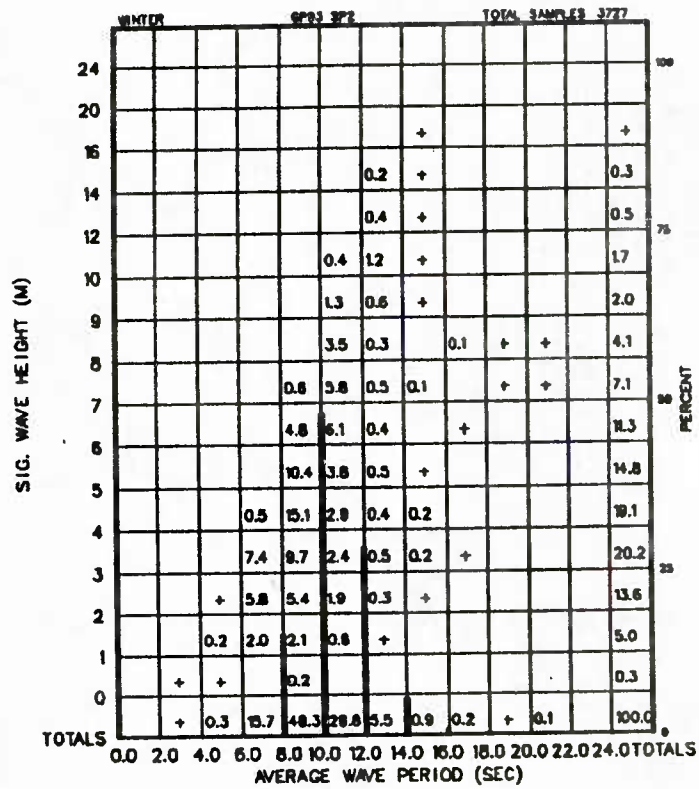


Figure A-2/093-2-7 Significant Wave Height vs. Average Wave Period

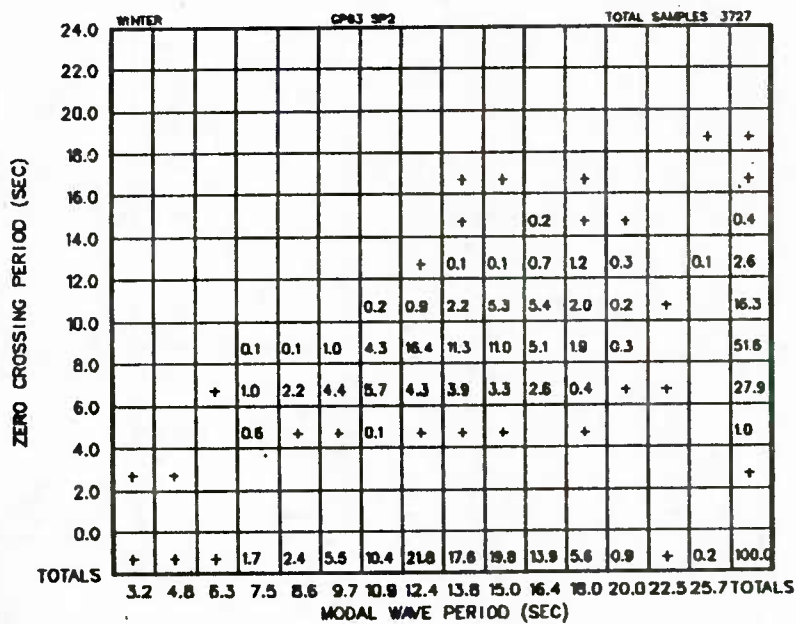


Figure A-2/093-2-8 Zero Crossing Period vs. Modal Wave Period

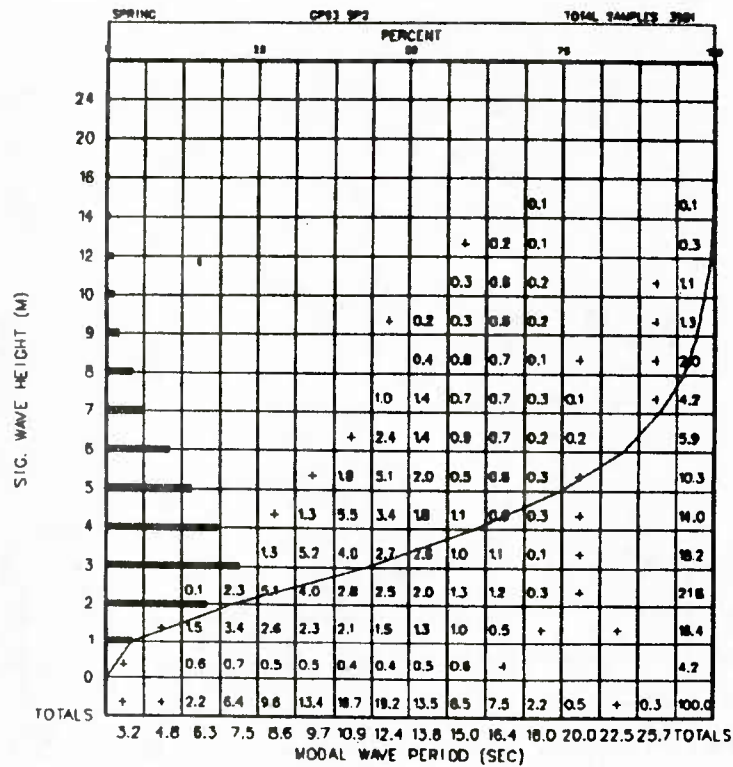


Figure A-2/093-3-1 Significant Wave Height vs. Modal Wave Period

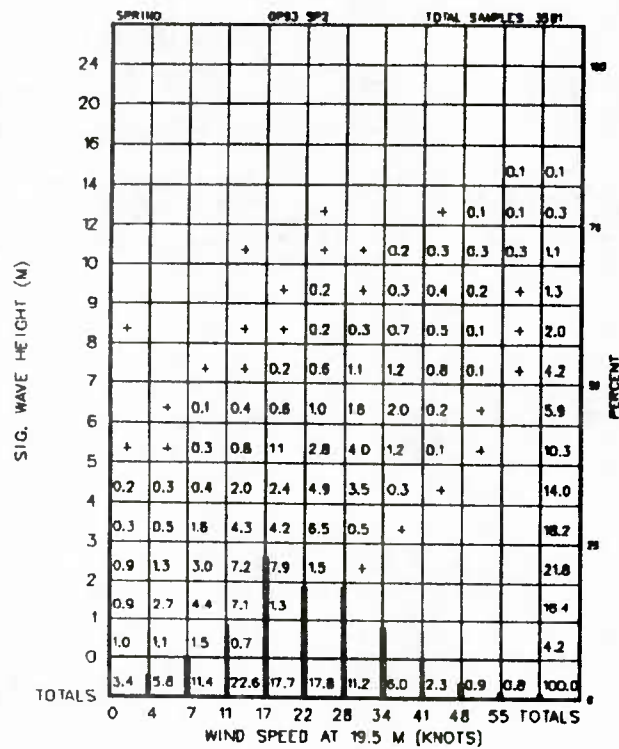


Figure A-2/093-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

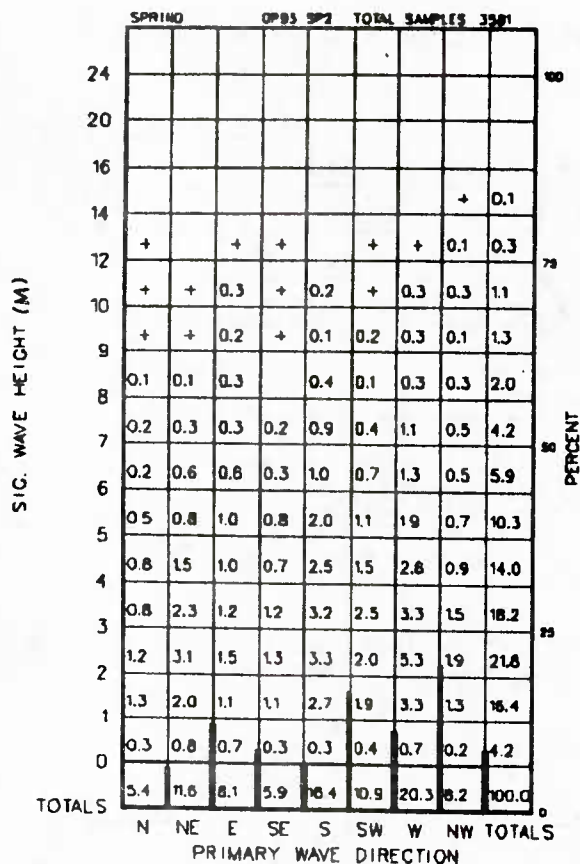


Figure A-2/093-3-3 Significant Wave Height vs. Primary Wave Direction

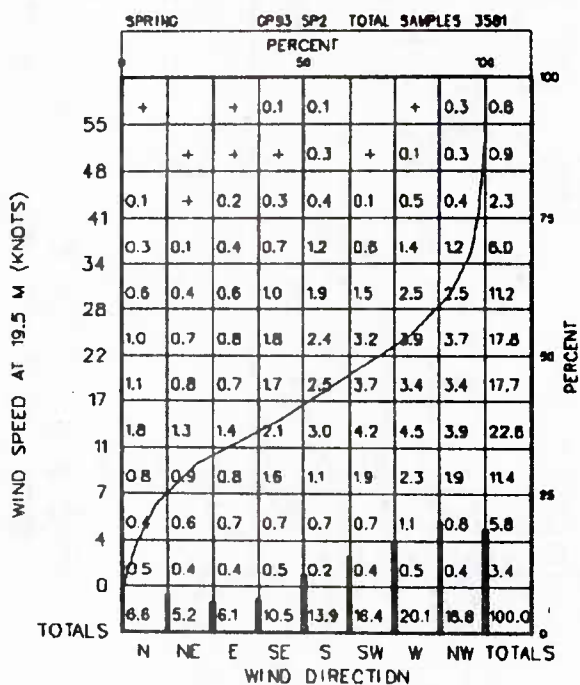


Figure A-2/093-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

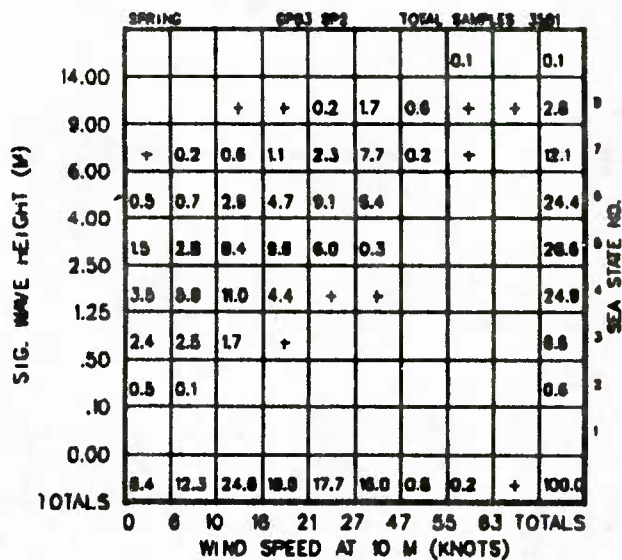


Figure A-2/093-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

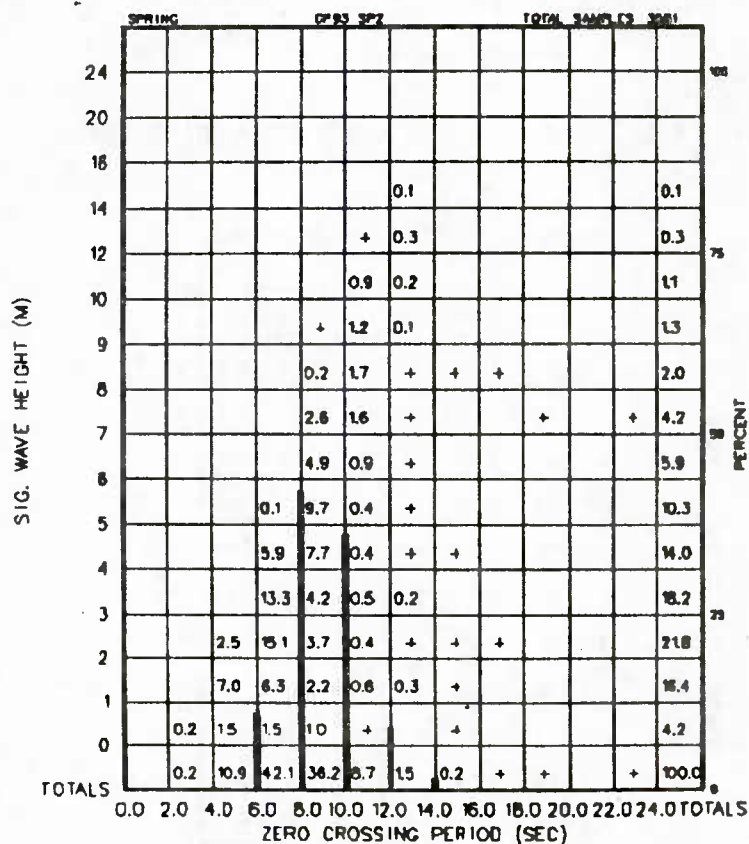


Figure A-2/093-3-6 Significant Wave Height vs. Zero Crossing Period

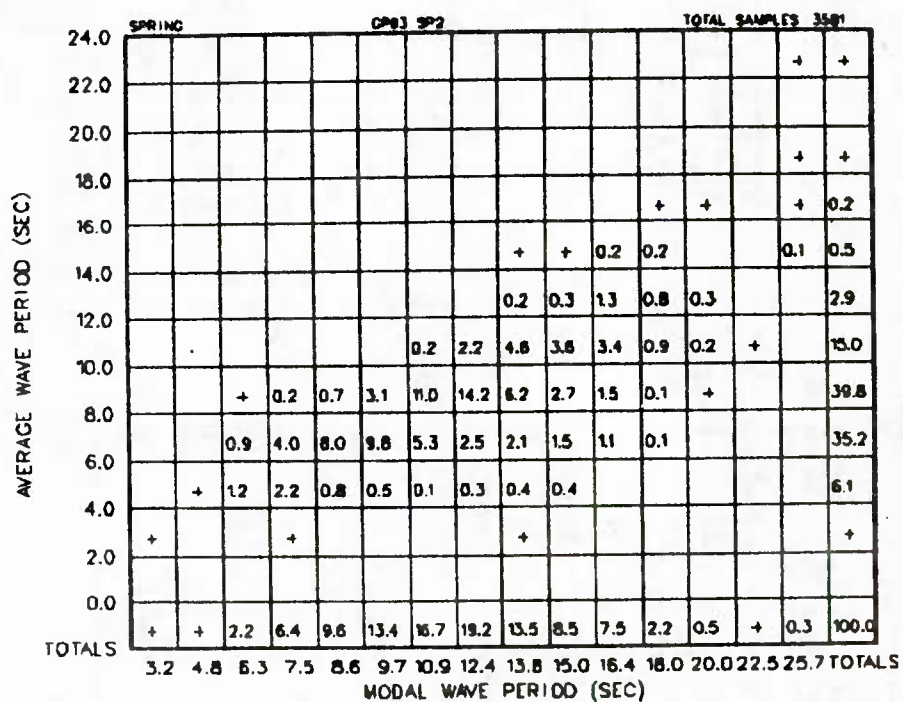


Figure A-2/093-3-9 Average Wave Period vs. Modal Wave Period

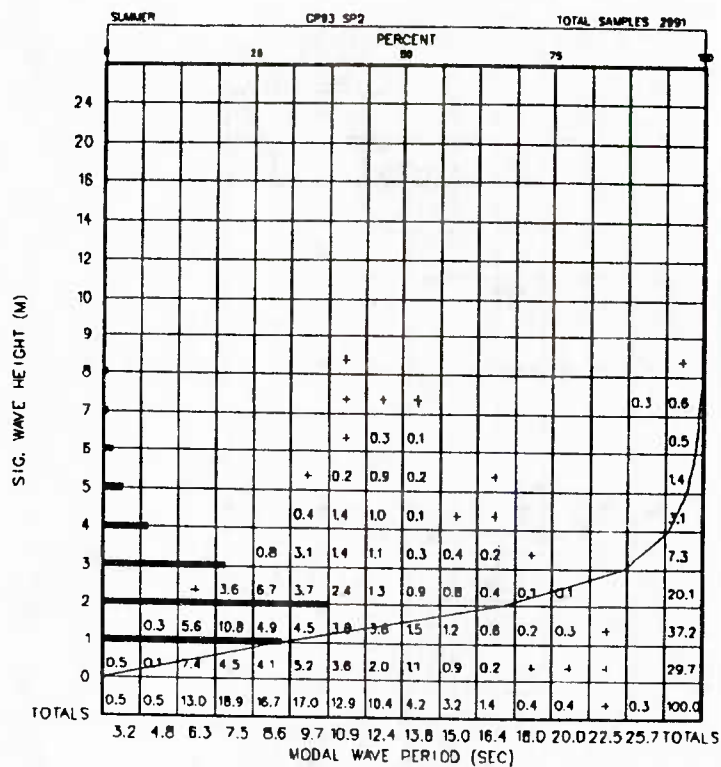


Figure A-2/093-4-1 Significant Wave Height vs. Modal Wave Period

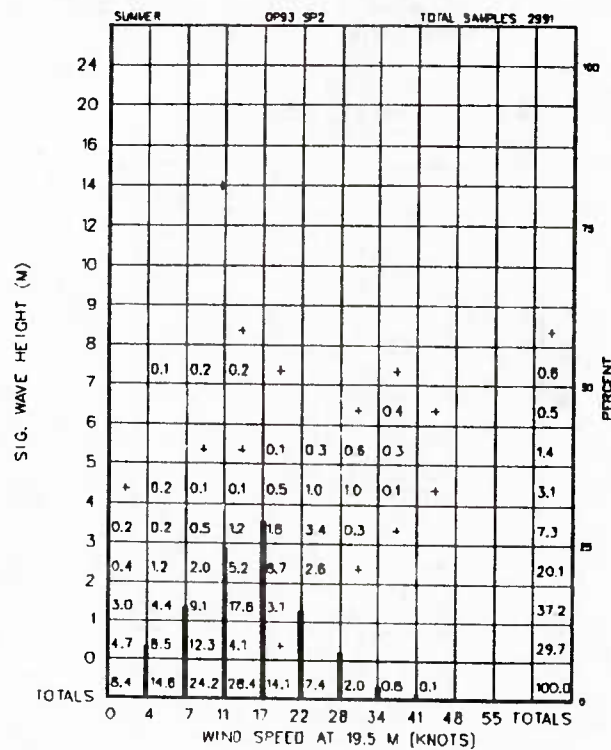


Figure A-2/093-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

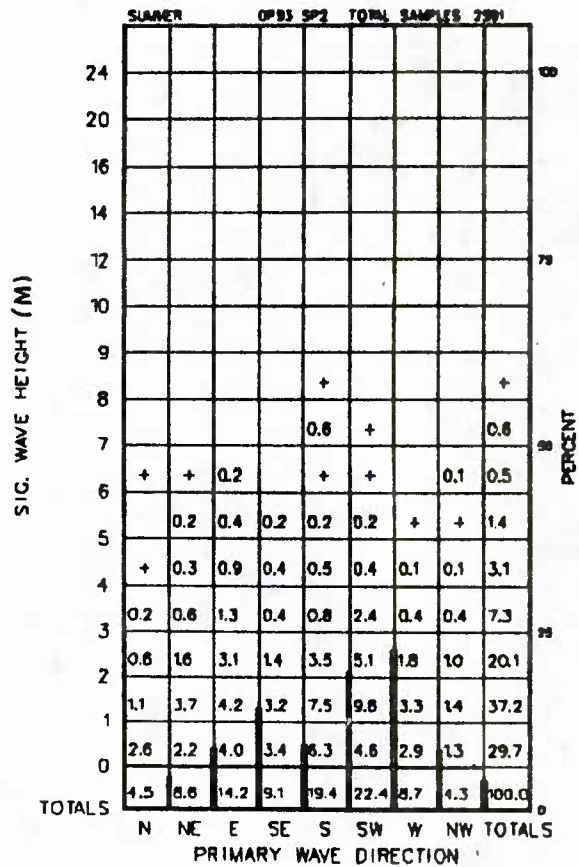


Figure A-2/093-4-3 Significant Wave Height vs. Primary Wave Direction

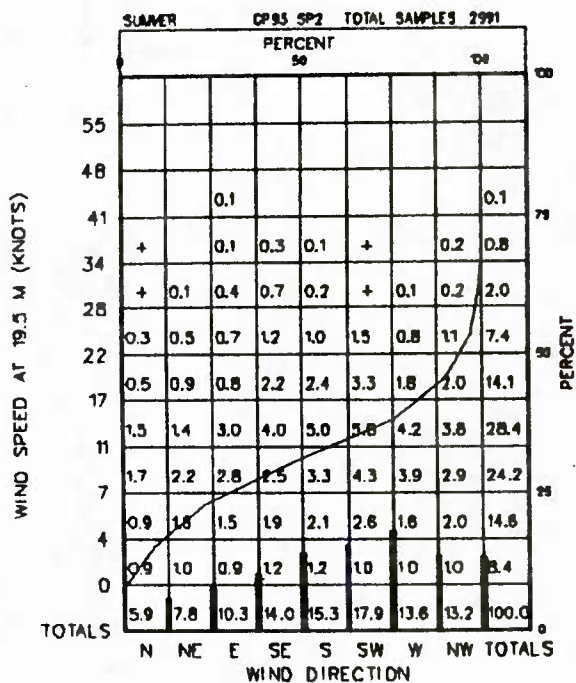


Figure A-2/093-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

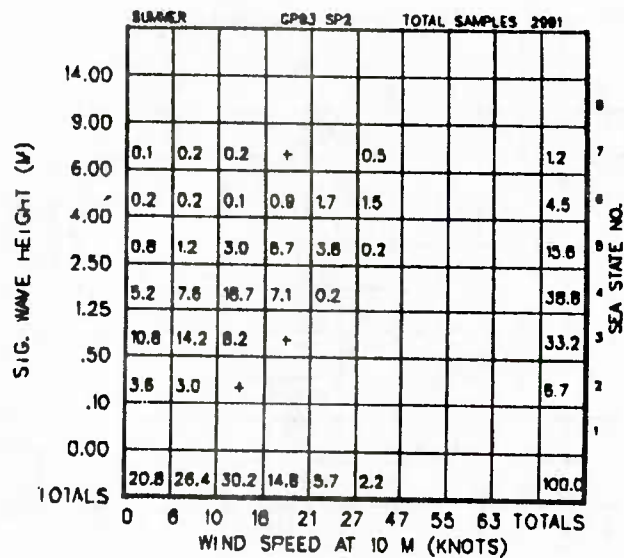


Figure A-2/093-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

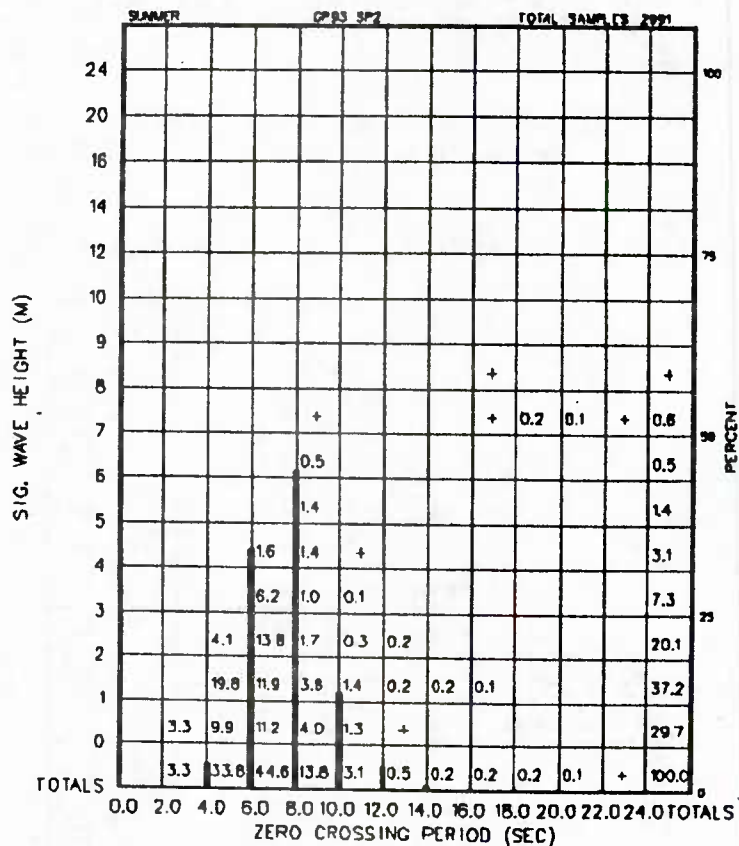


Figure A-2/093-4-6 Significant Wave Height vs. Zero Crossing Period

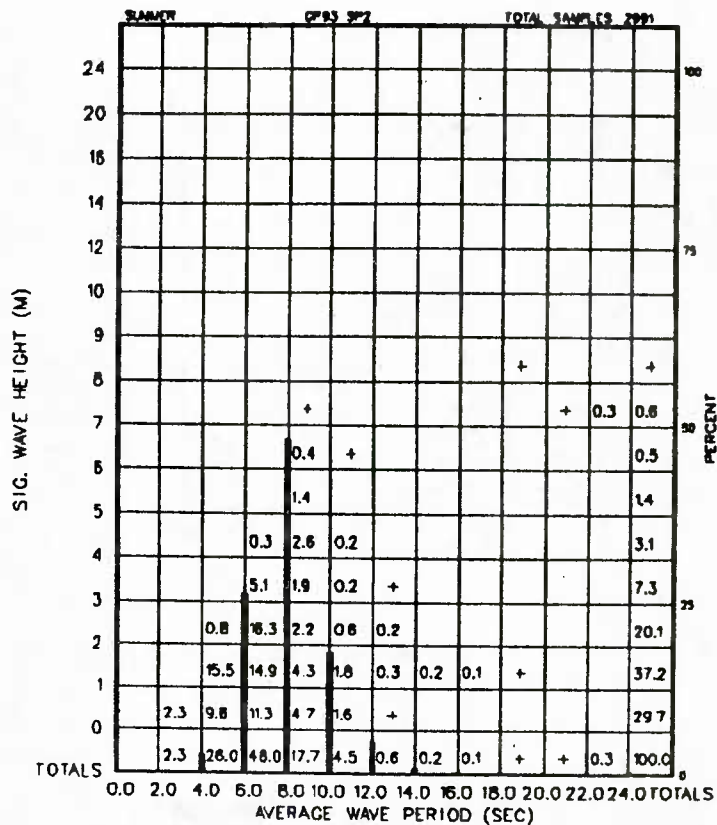


Figure A-2/093-4-7 Significant Wave Height vs. Average Wave Period

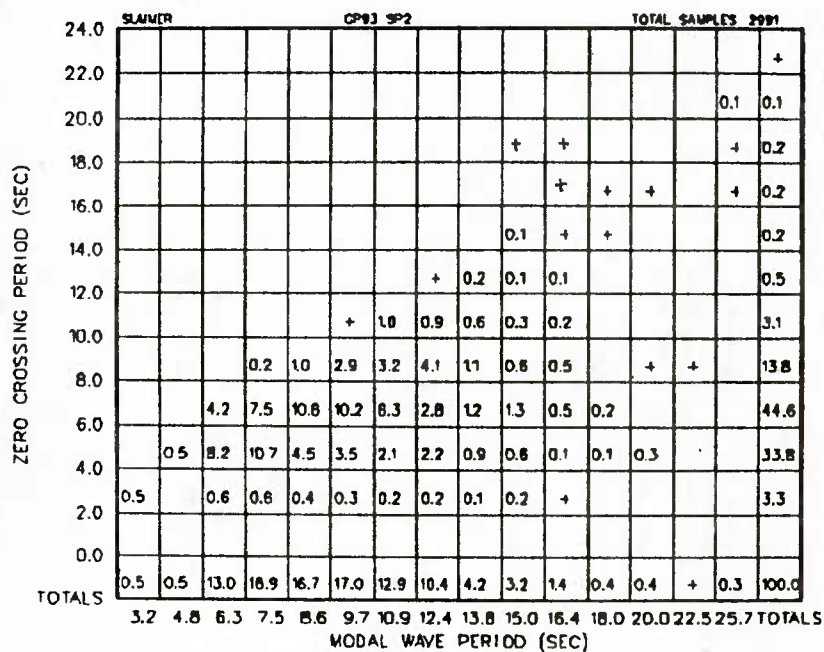
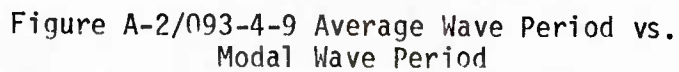


Figure A-2/093-4-8 Zero Crossing Period vs. Modal Wave Period



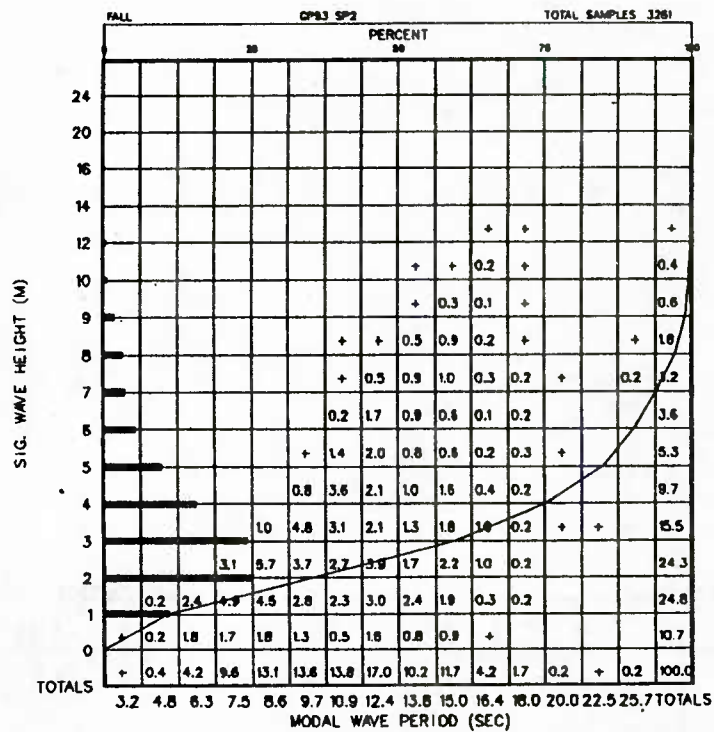


Figure A-2/093-5-1 Significant Wave Height vs. Modal Wave Period

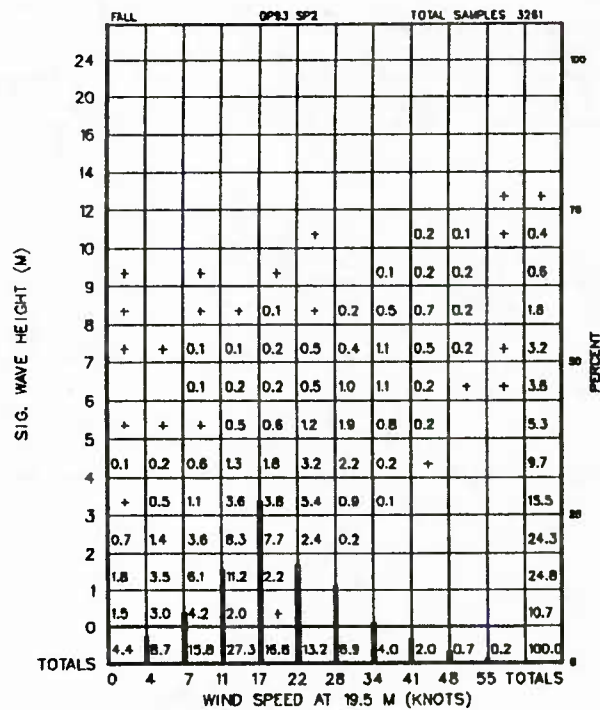


Figure A-2/093-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

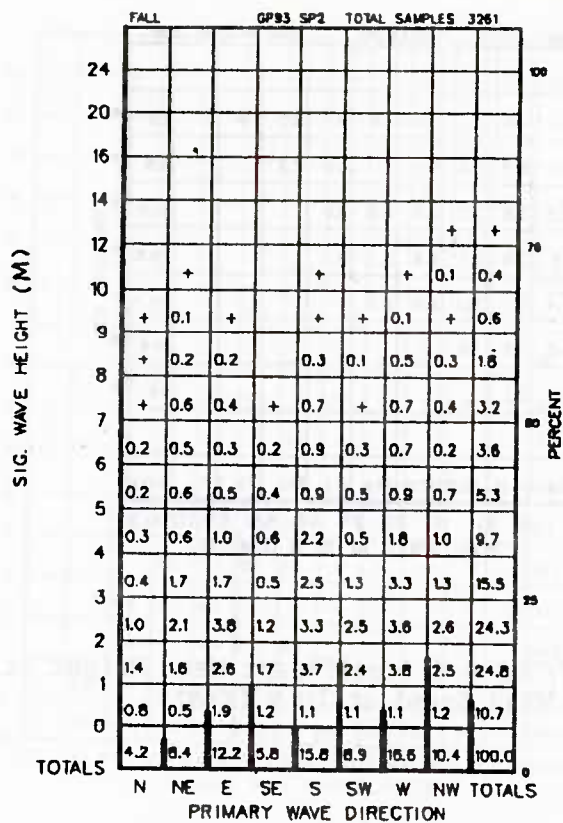


Figure A-2/093-5-3 Significant Wave Height vs. Primary Wave Direction

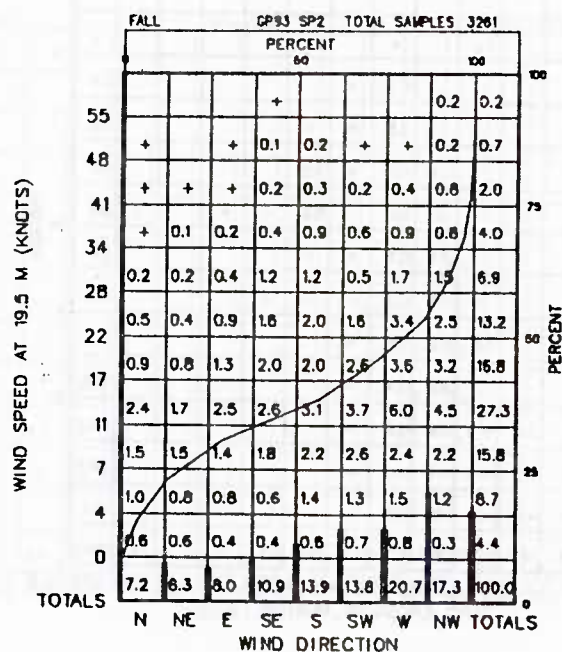


Figure A-2/093-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

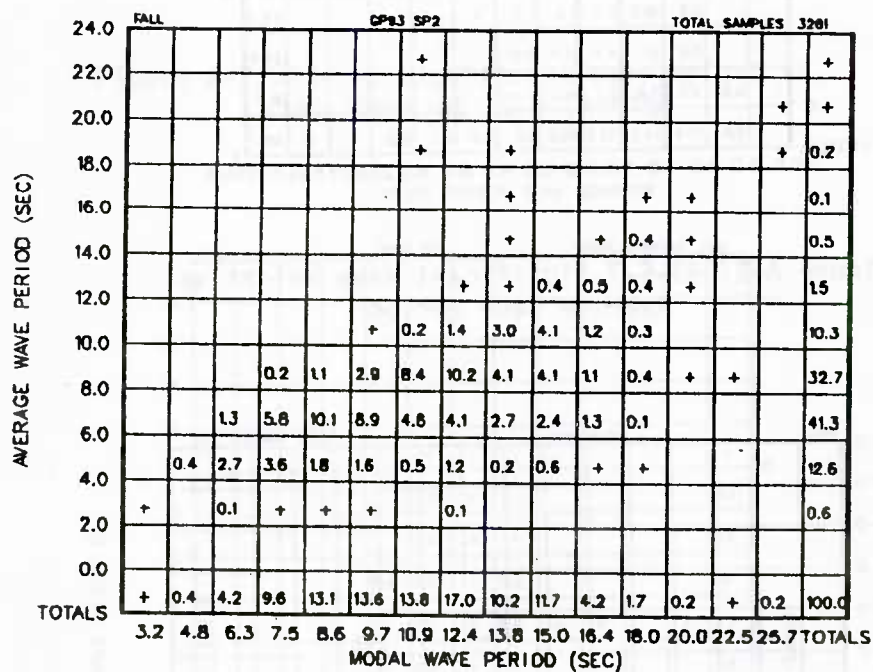


Figure A-2/093-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-102-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 24.78°N, 162.46°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 5 -	1.5 10 -	4 18 -	1.5 11 -	1.5 6.3 NE
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.25 -	11.5 1.5 -	22.5 3.5 -	12.5 1.5 -	14 1.5 E
Visibility, nautical miles	7	20	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0.5	4 3	7.5 7	- -	- -
Precipitation (Occurrence)	All precipitation - 8% of the time				
Relative Humidity, %	62	78	95	-	-
Air Temperature, °C	22.5	24.5	28	24.5	-
Sea Surface Temperature, °C	24	26.5	28.5	-	-
Sea Level Pressure, millibars	1010	1017	1021	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	357 - -	- 3% 3%

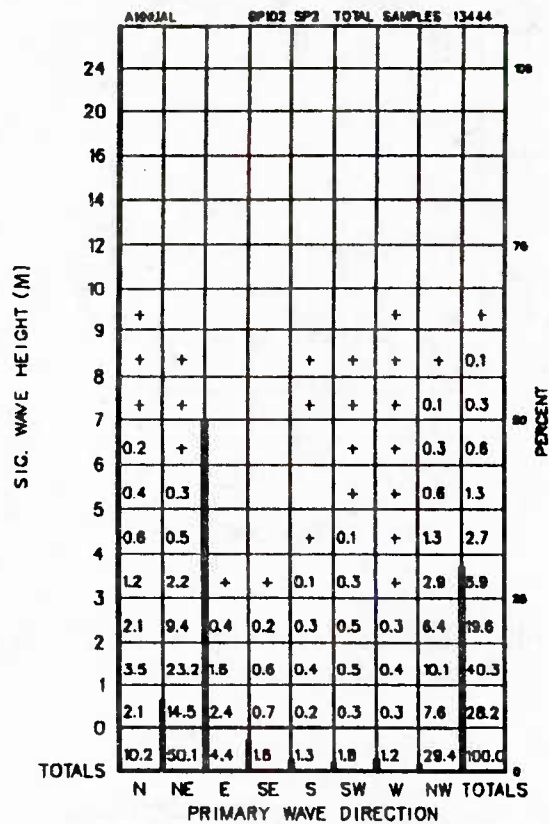


Figure A-102-1-3 Significant Wave Height vs. Primary Wave Direction

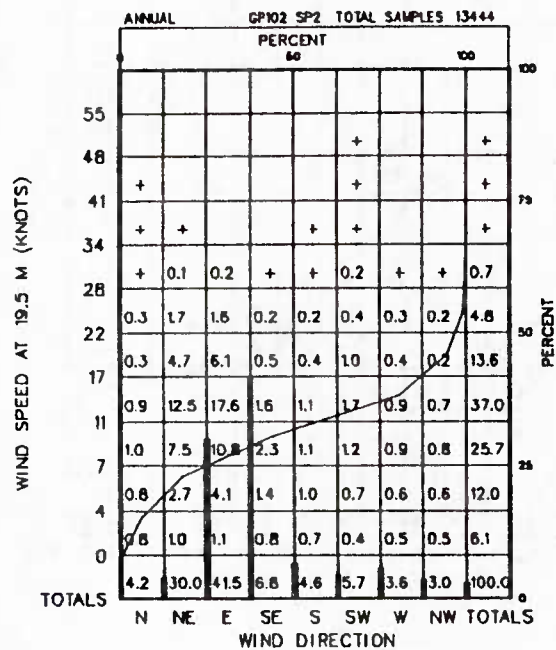


Figure A-102-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

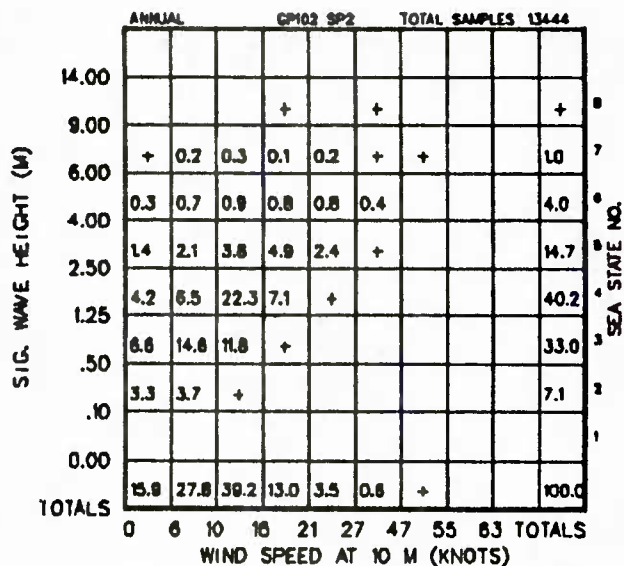


Figure A-102-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

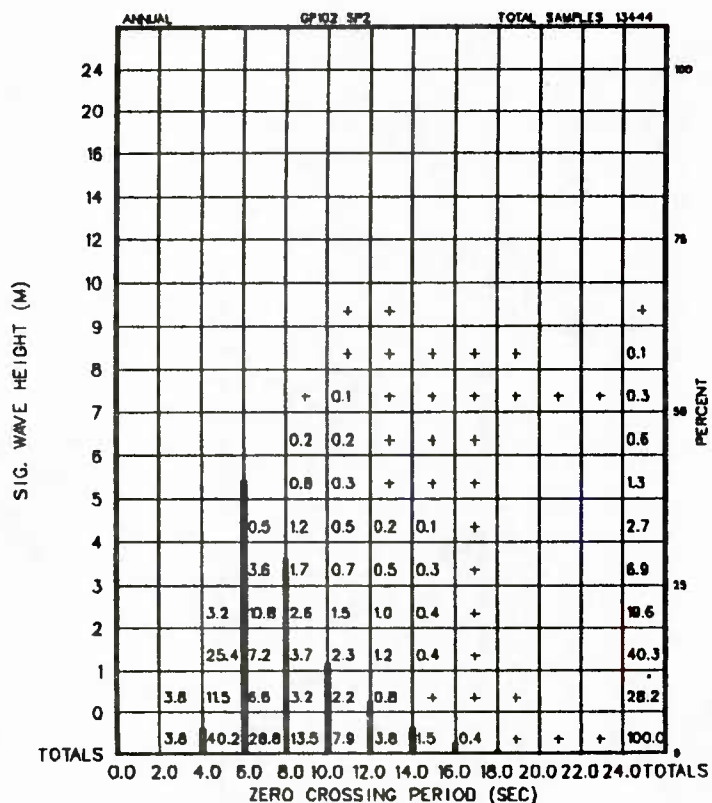


Figure A-102-1-6 Significant Wave Height vs. Zero Crossing Period

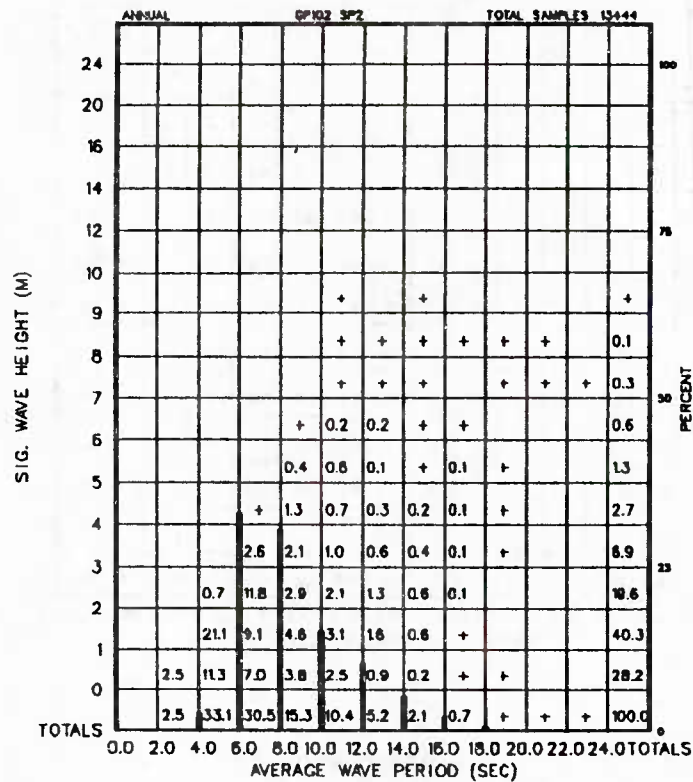


Figure A-102-1-7 Significant Wave Height vs. Average Wave Period

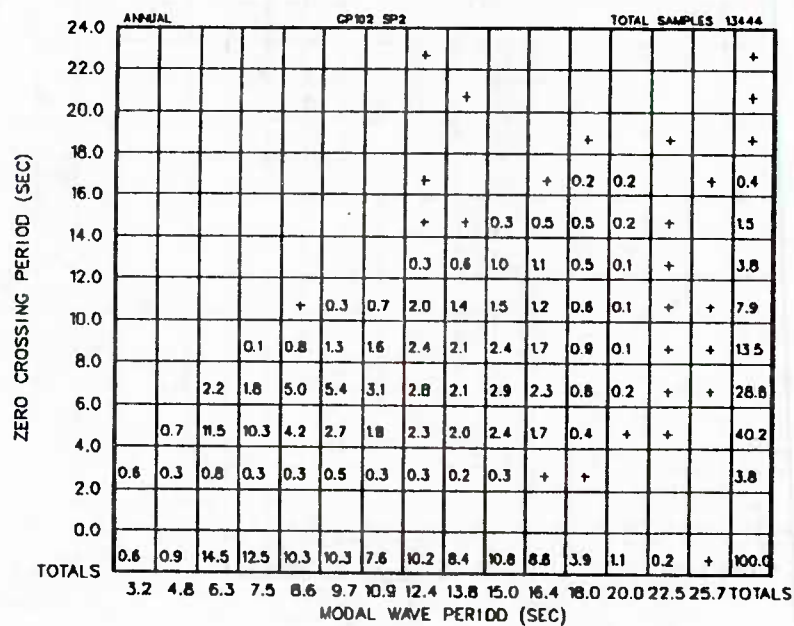


Figure A-102-1-8 Zero Crossing Period vs. Modal Wave Period

		ANNUAL												OP102 SP2												TOTAL SAMPLES 13444																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Figure A-102-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

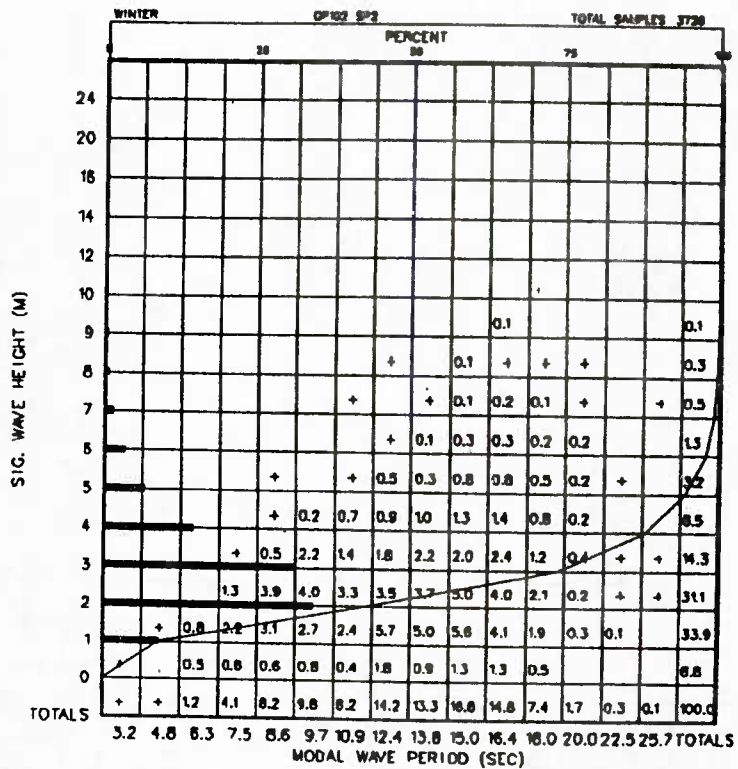


Figure A-102-2-1 Significant Wave Height vs. Modal Wave Period

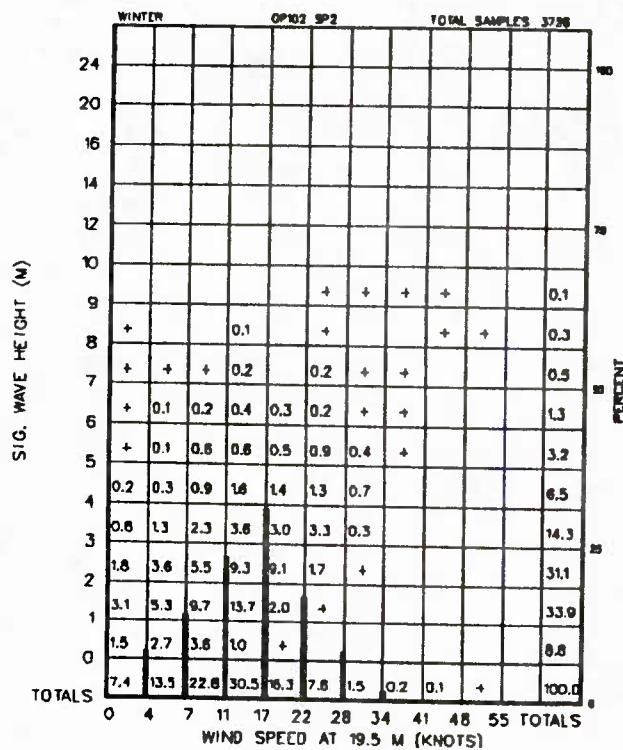


Figure A-102-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

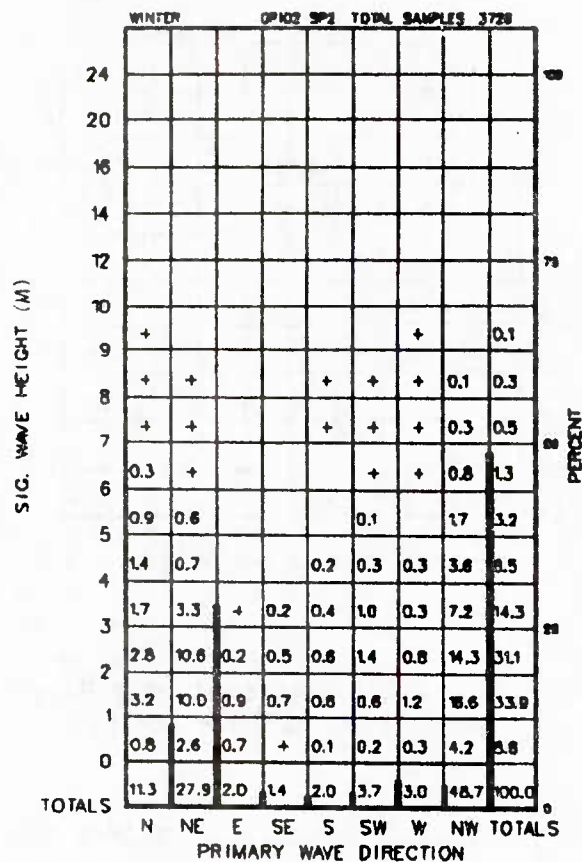


Figure A-102-2-3 Significant Wave Height vs. Primary Wave Direction

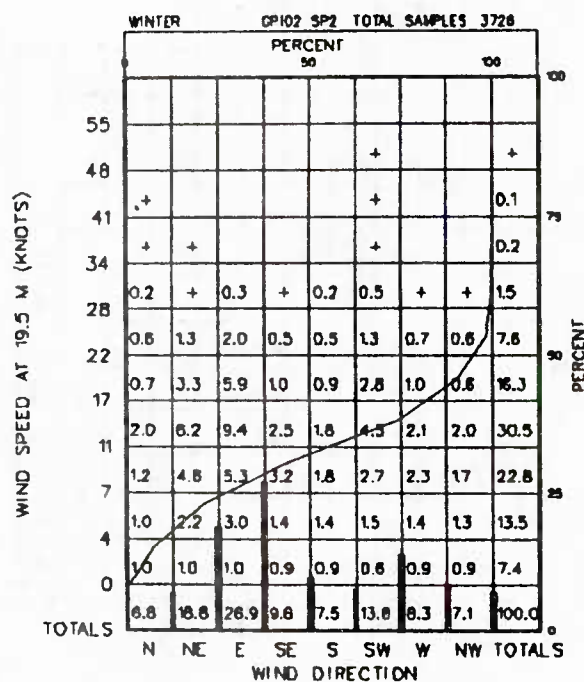


Figure A-102-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

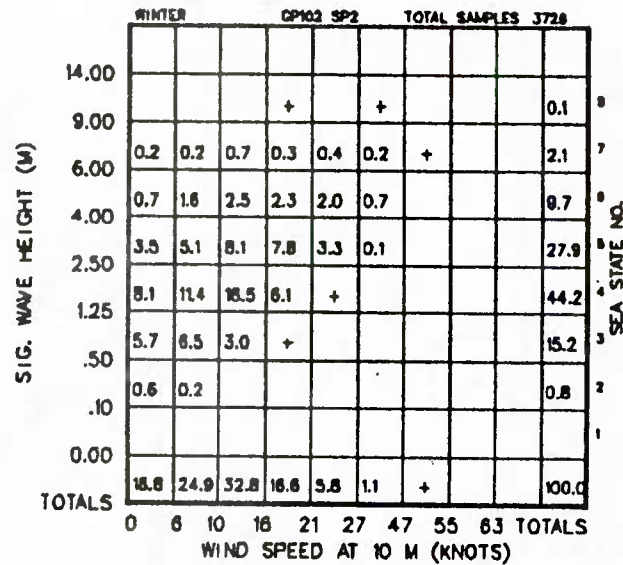


Figure A-102-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

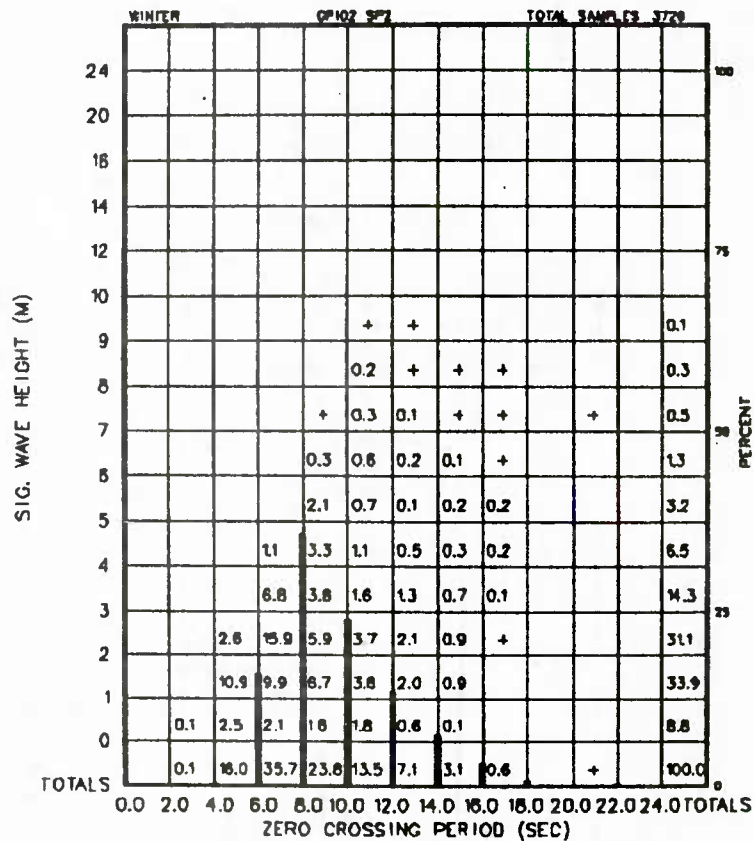


Figure A-102-2-6 Significant Wave Height vs. Zero Crossing Period

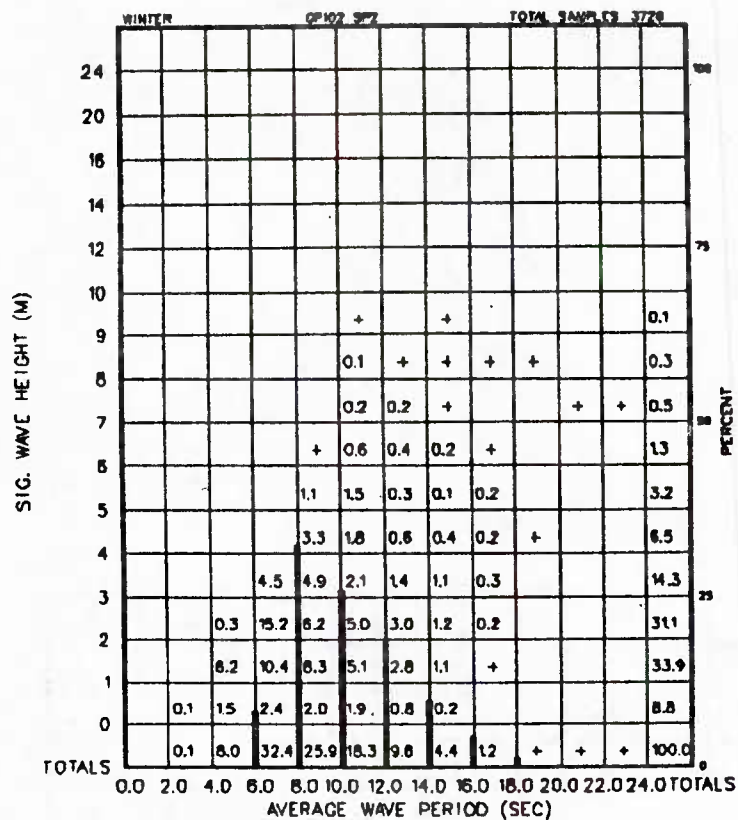


Figure A-102-2-7 Significant Wave Height vs. Average Wave Period

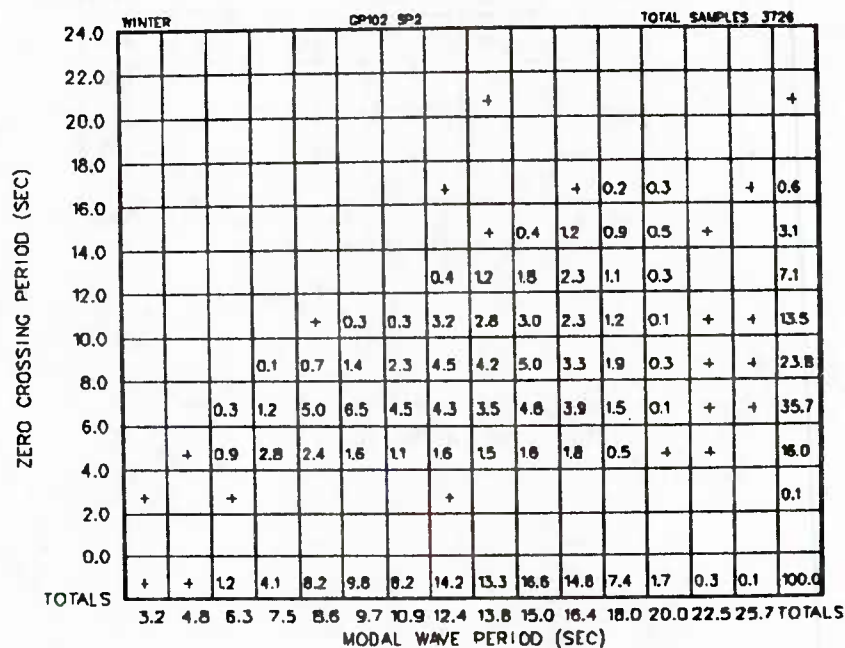


Figure A-102-2-8 Zero Crossing Period vs. Modal Wave Period

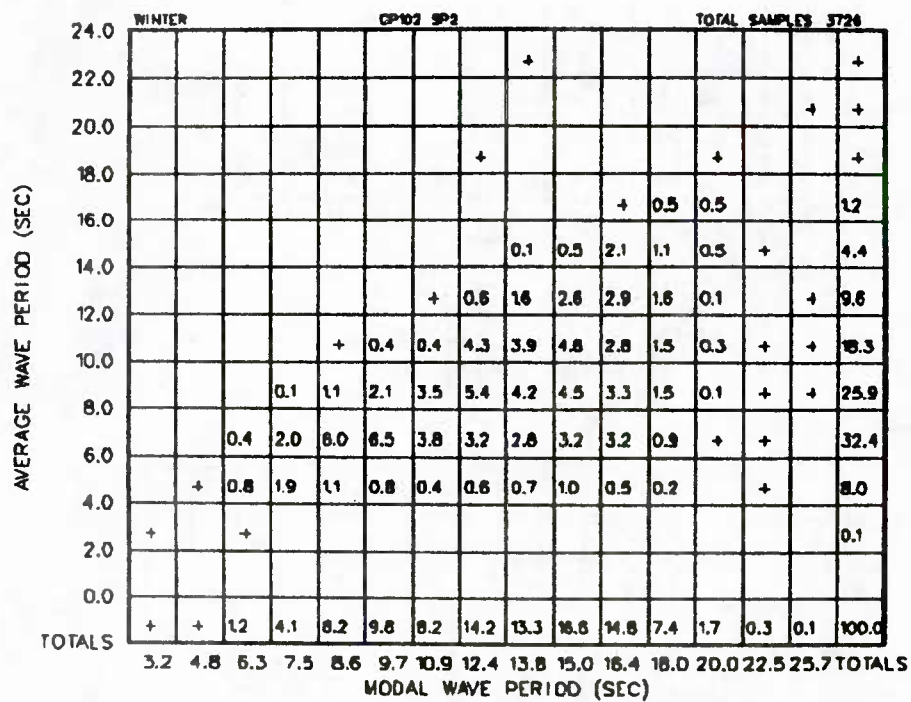


Figure A-102-2-9 Average Wave Period vs.
Modal Wave Period

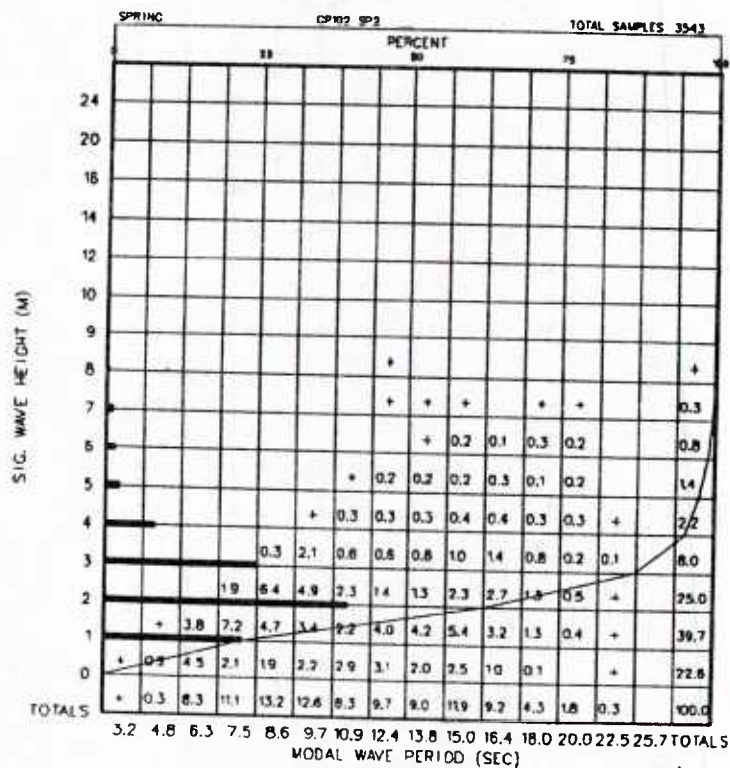


Figure A-102-3-1 Significant Wave Height vs. Modal Wave Period

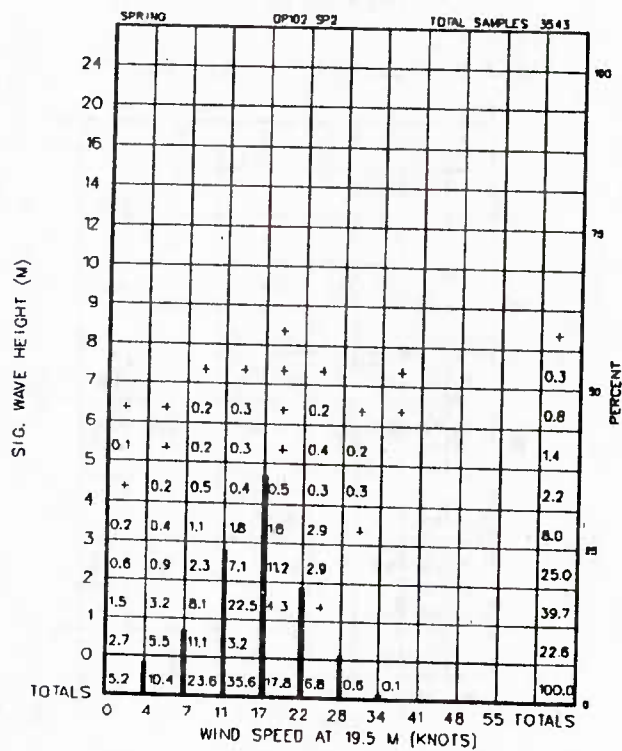


Figure A-102-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

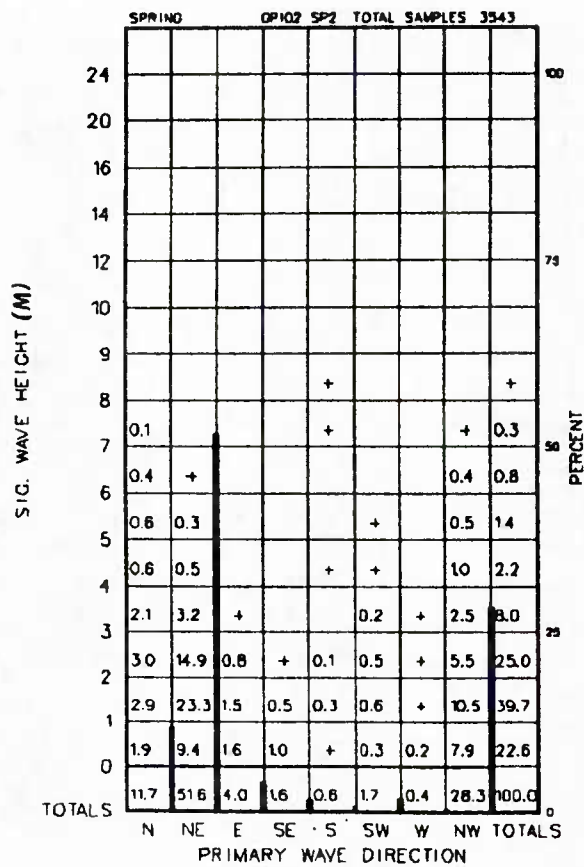


Figure A-102-3-3 Significant Wave Height vs. Primary Wave Direction

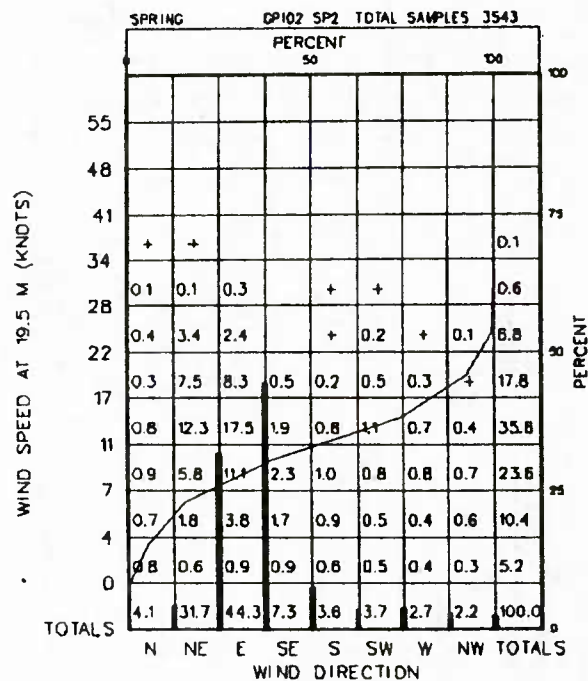


Figure A-102-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

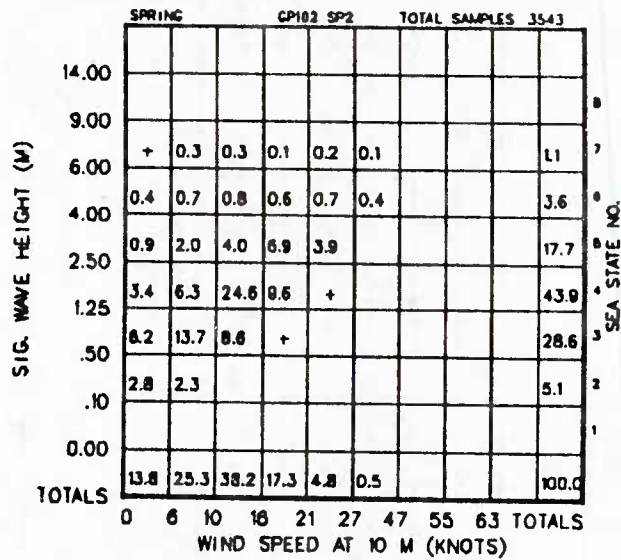


Figure A-102-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

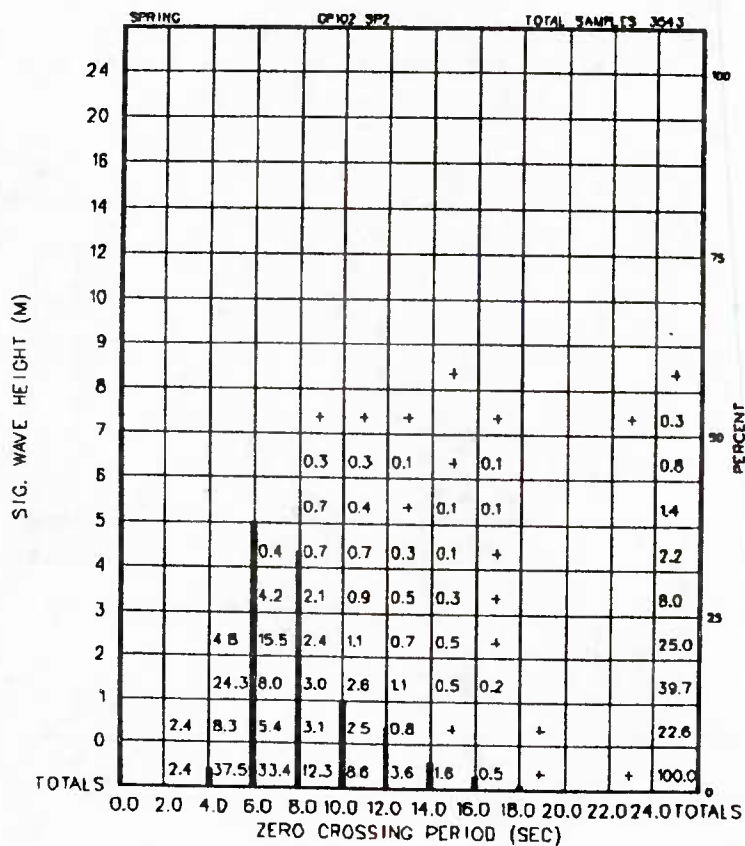
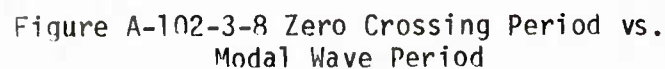
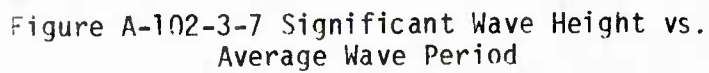


Figure A-102-3-6 Significant Wave Height vs. Zero Crossing Period



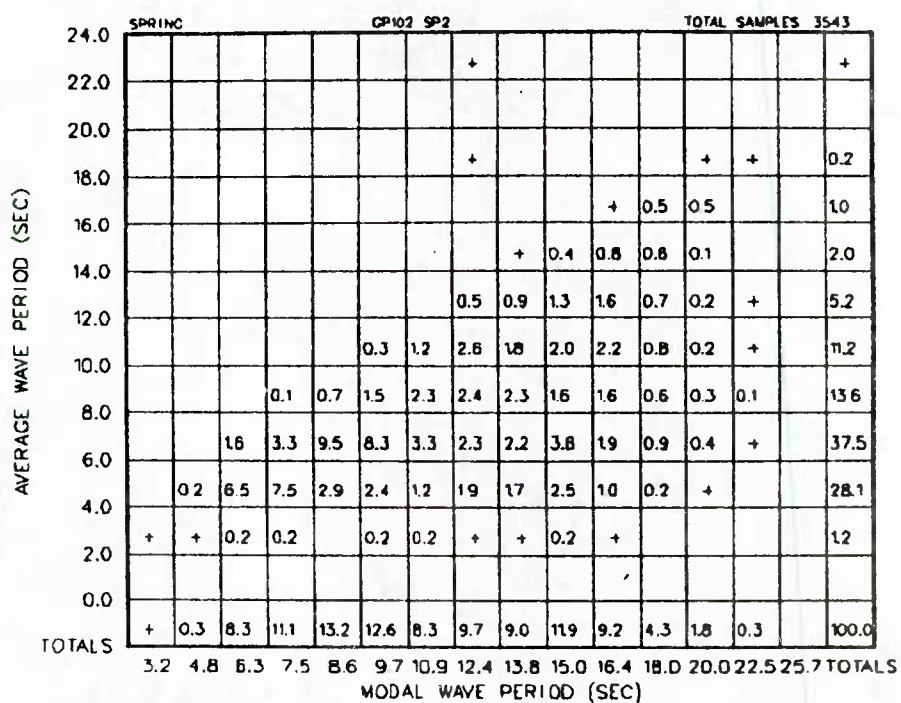


Figure A-102-3-9 Average Wave Period vs.
Modal Wave Period

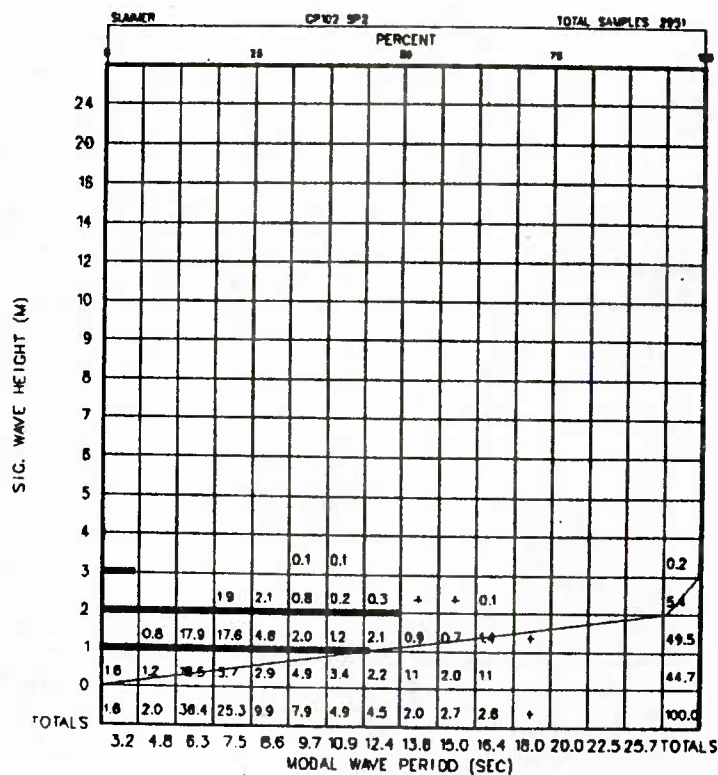


Figure A-102-4-1 Significant Wave Height vs. Modal Wave Period

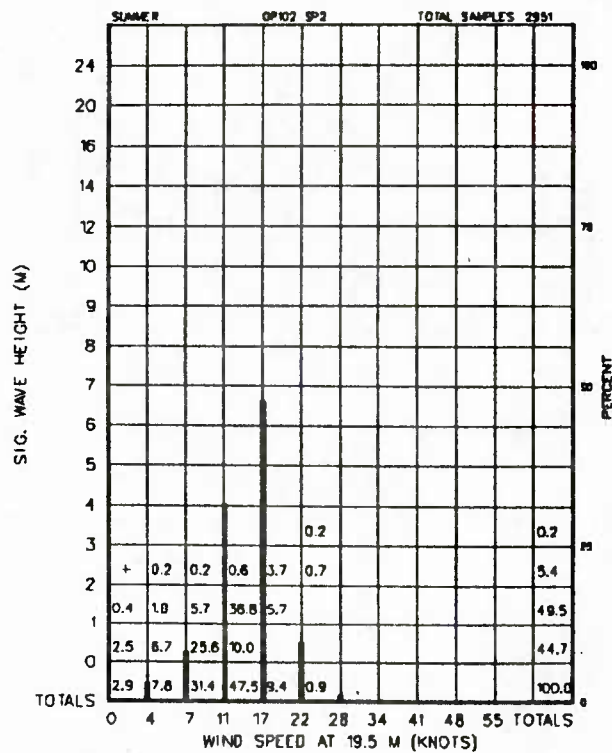


Figure A-102-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

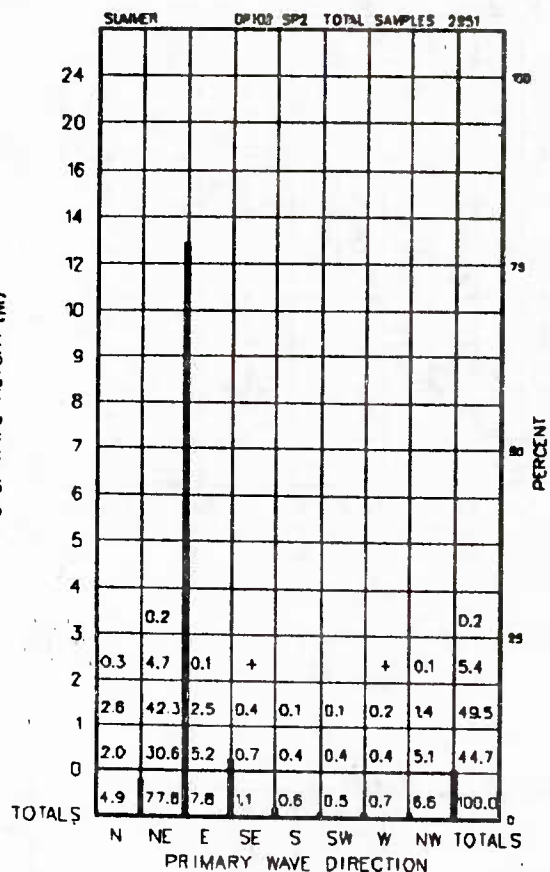


Figure A-102-4-3 Significant Wave Height vs. Primary Wave Direction

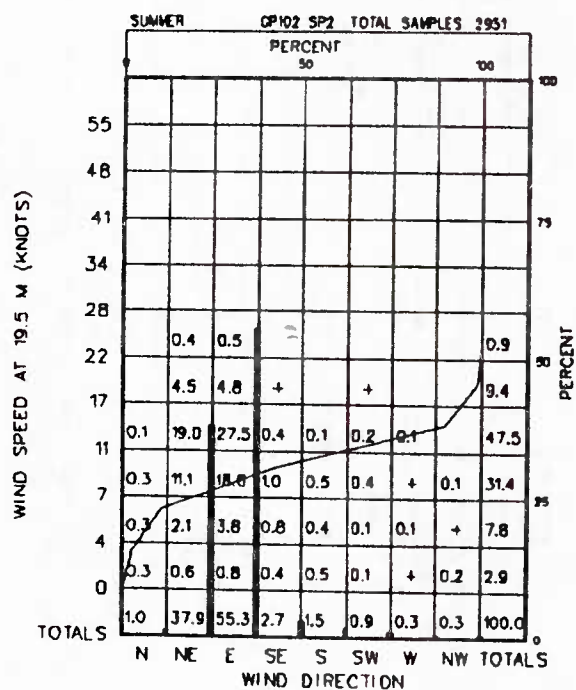


Figure A-102-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

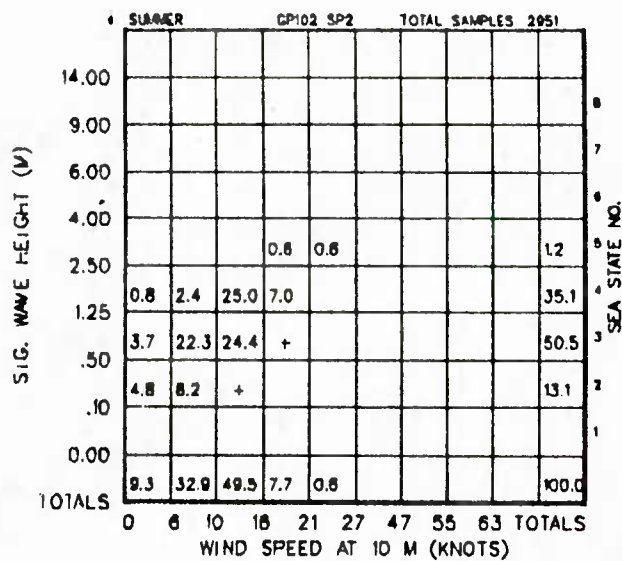


Figure A-102-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

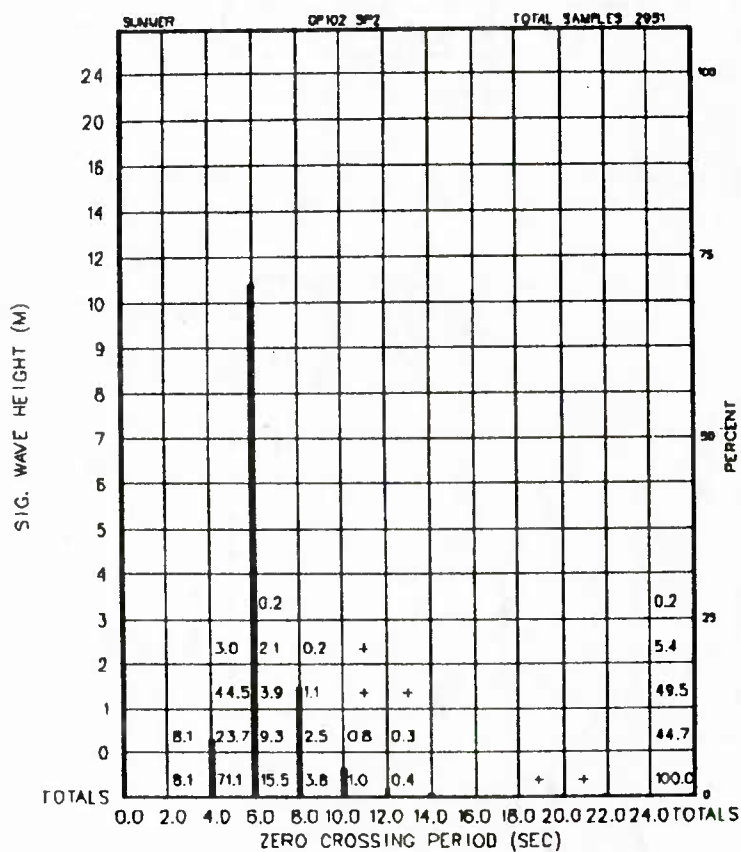


Figure A-102-4-6 Significant Wave Height vs. Zero Crossing Period

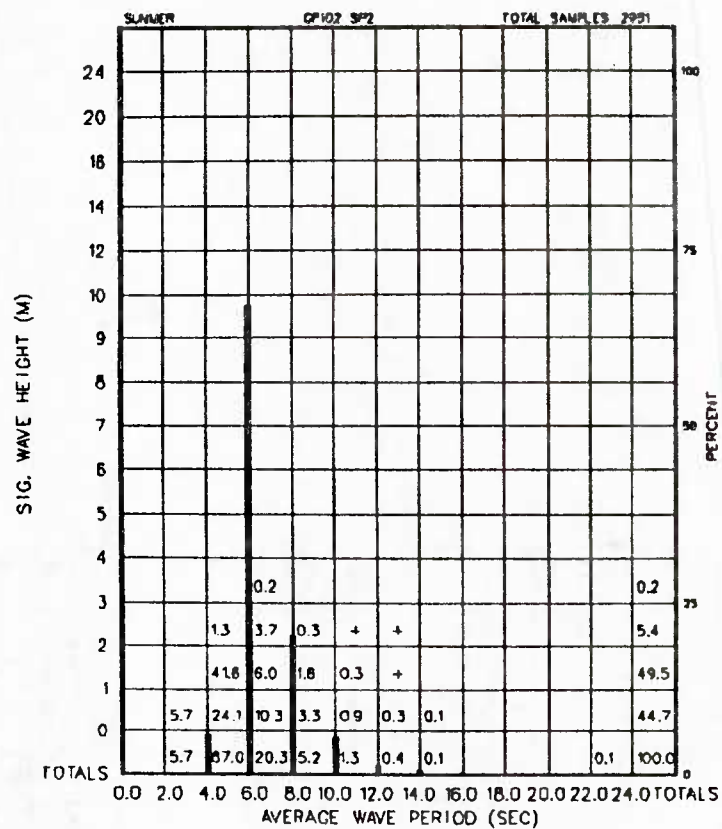


Figure A-102-4-7 Significant Wave Height vs. Average Wave Period

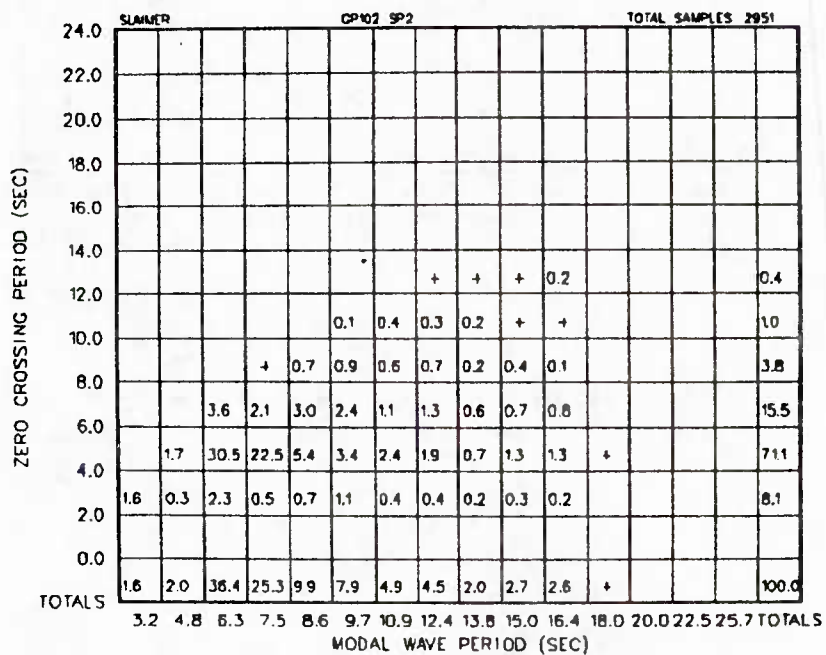


Figure A-102-4-8 Zero Crossing Period vs. Modal Wave Period

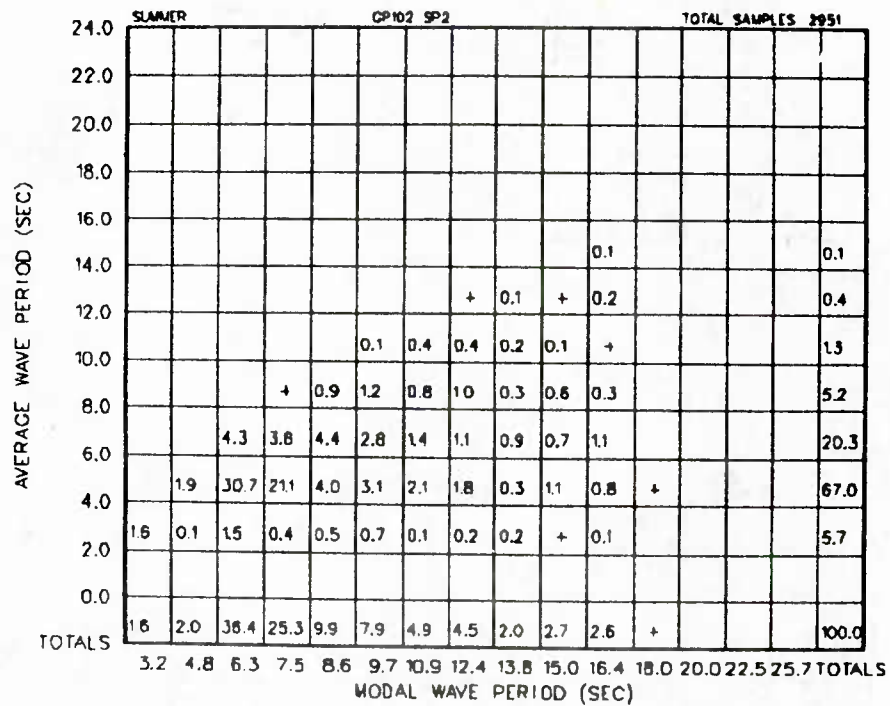


Figure A-102-4-9 Average Wave Period vs.
Modal Wave Period

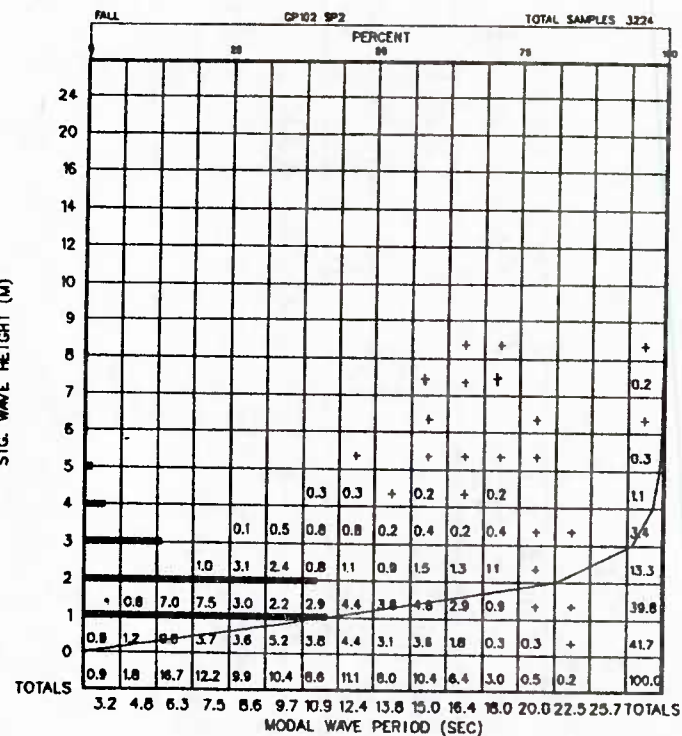


Figure A-102-5-1 Significant Wave Height vs. Modal Wave Period

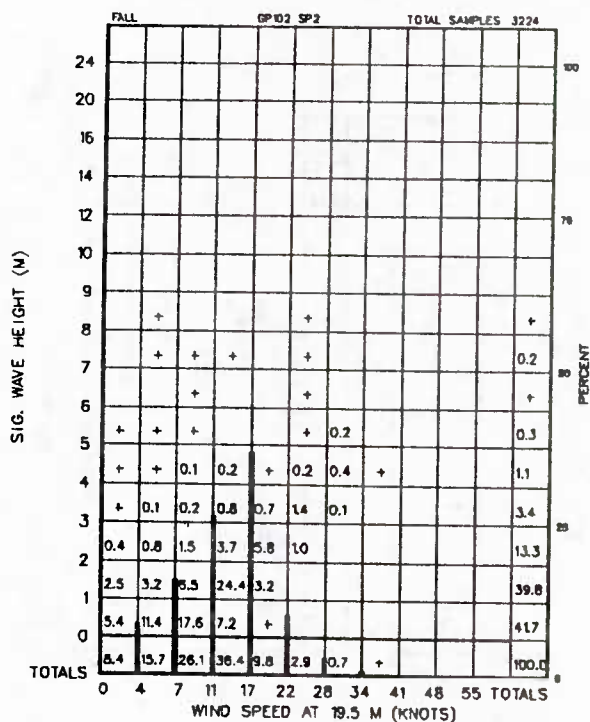


Figure A-102-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

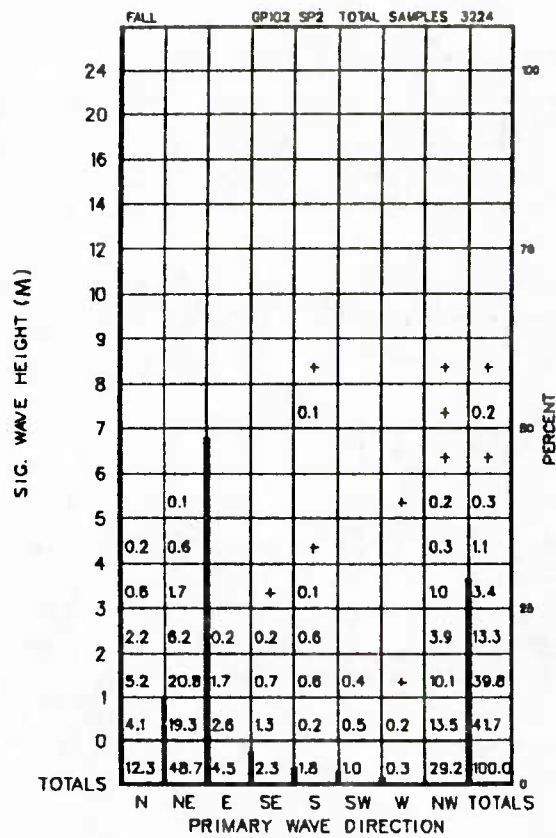


Figure A-102-5-3 Significant Wave Height vs. Primary Wave Direction

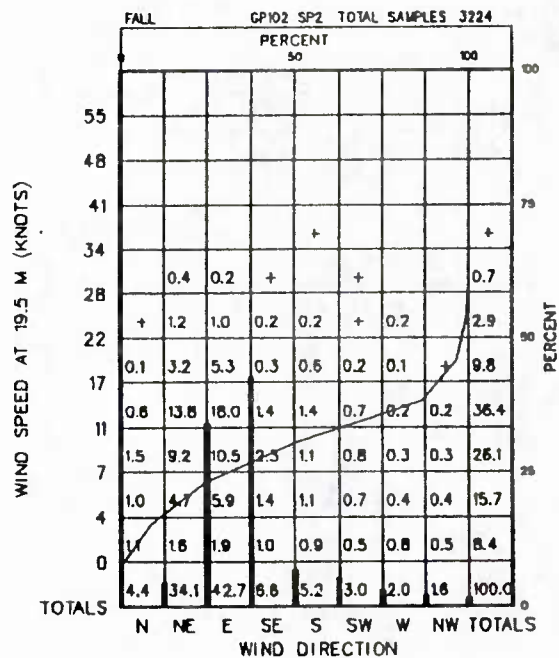


Figure A-102-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

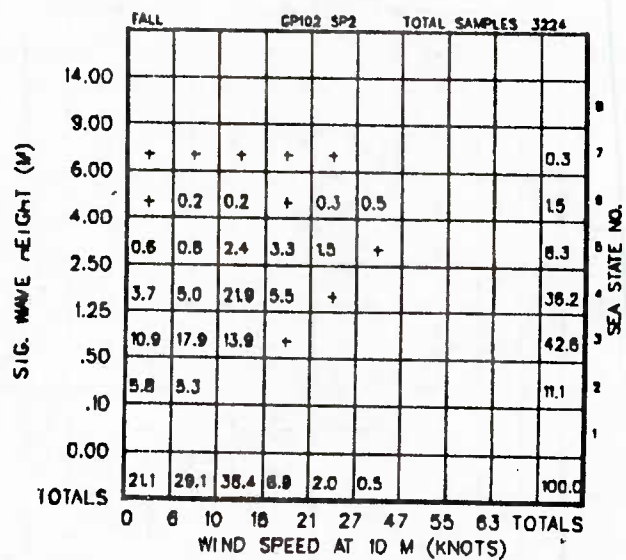


Figure A-102-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

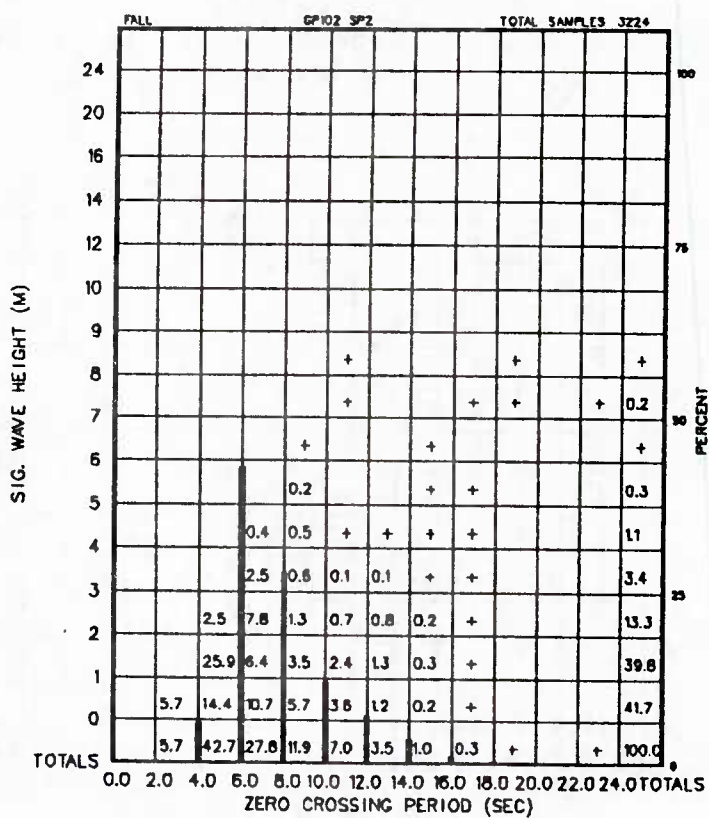
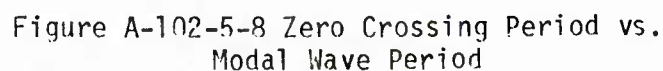
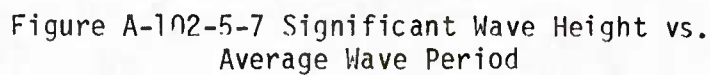


Figure A-102-5-6 Significant Wave Height vs. Zero Crossing Period



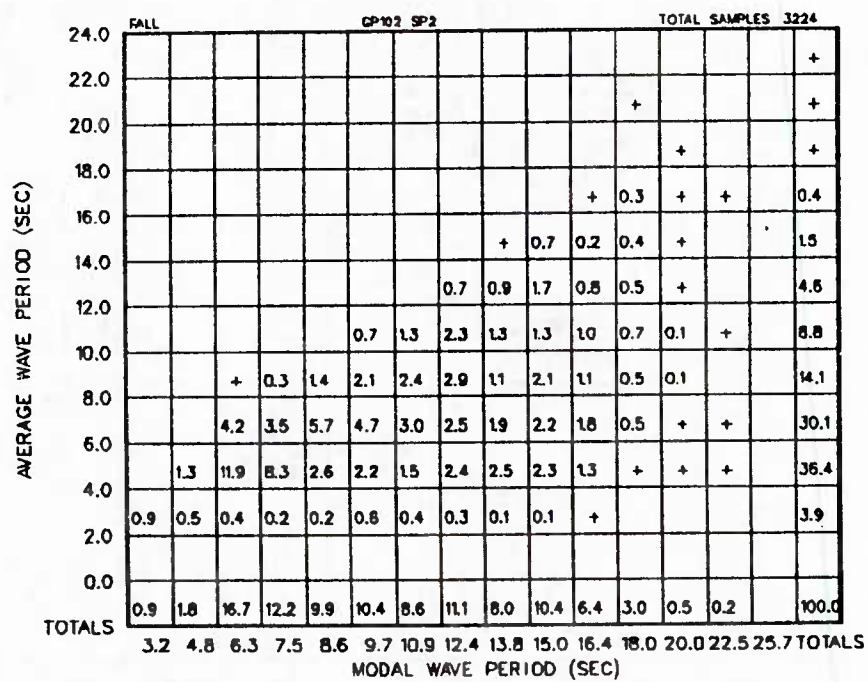


Figure A-102-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-152-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.16°N, 163.78°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25. 6 -	2 10.5 -	5.5 17.5 -	2.5 11 -	1.5 9.7 W-N
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	13 2 -	31.5 5 -	14.5 2 -	14 2 SW
Visibility, nautical miles	5	18	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6	8 7.5	- -	- -
Precipitation (Occurrence)	All precipitation - 17% of the time				
Relative Humidity, %	62	84	98	-	-
Air Temperature, °C	14	18	21	17.5	-
Sea Surface Temperature, °C	19	22	24	-	-
Sea Level Pressure, millibars	1002	1016	1028	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	352 - -	- 1% 2%

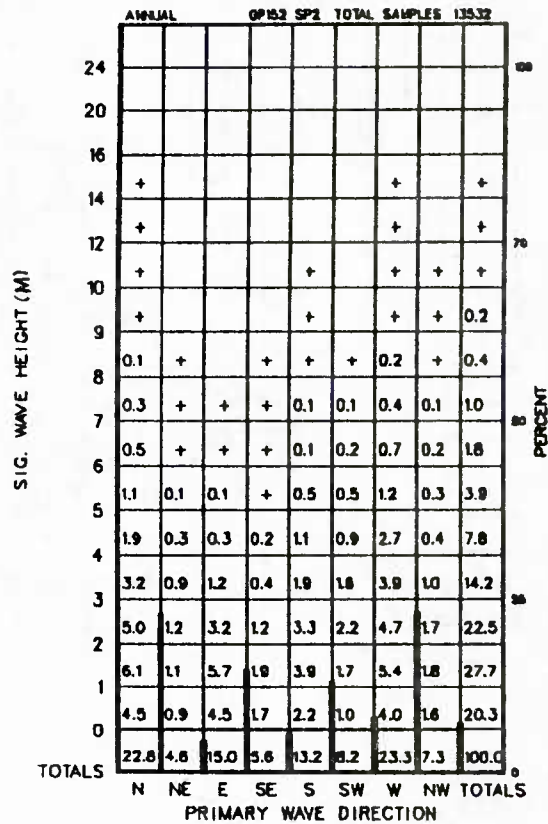


Figure A-152-1-3 Significant Wave Height vs. Primary Wave Direction

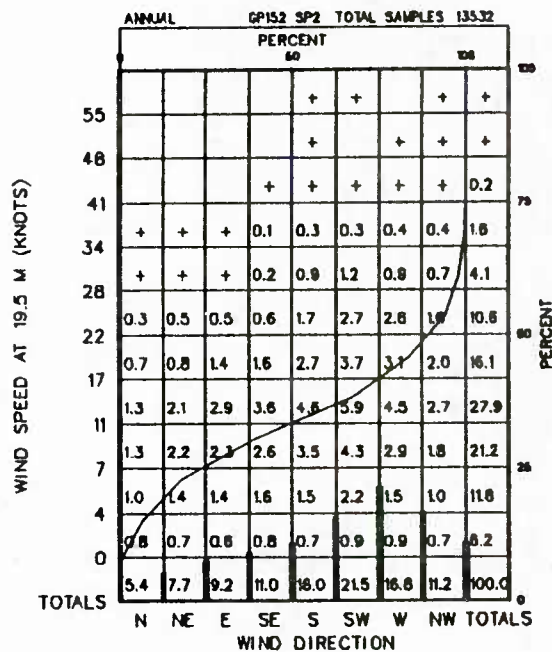
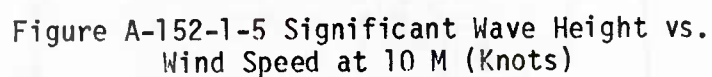
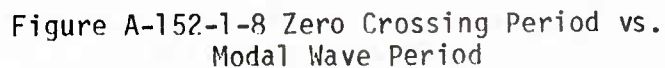
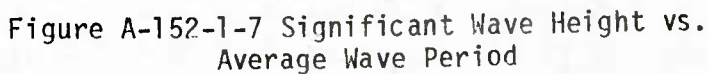


Figure A-152-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction





ANNUAL		OP152 SP2																TOTAL SAMPLES 13372					
WIND SPEED AT 19.5 M (KNOTS)	55	4																		4	100		
	48	5		1																6	75		
	41	22	1	2																25	75		
	34	92	30	8	8	1		1												136	75		
	28	249	73	31	9	6	1													369	75		
	22	483	195	79	35	15	10		3	2	1									823	75		
	17	780	297	117	56	22	13	2	3	1										1291	75		
	11	867	417	205	128	54	36	22	11	8	8	4	1						1	1780	75		
	7	919	340	141	79	39	18	13	5	1	2	3		1			1	1		1561	75		
	4	637	202	88	29	24	5	3	2											968	75		
	0	317	99	50	19	5	4	8					1							501	75		
	TOTALS	4375	1554	718	363	166	85	47	24	12	9	7	2	1			1	1		1	7408	75	
		DURATION (HOURS)																TOTALS					
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-152-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

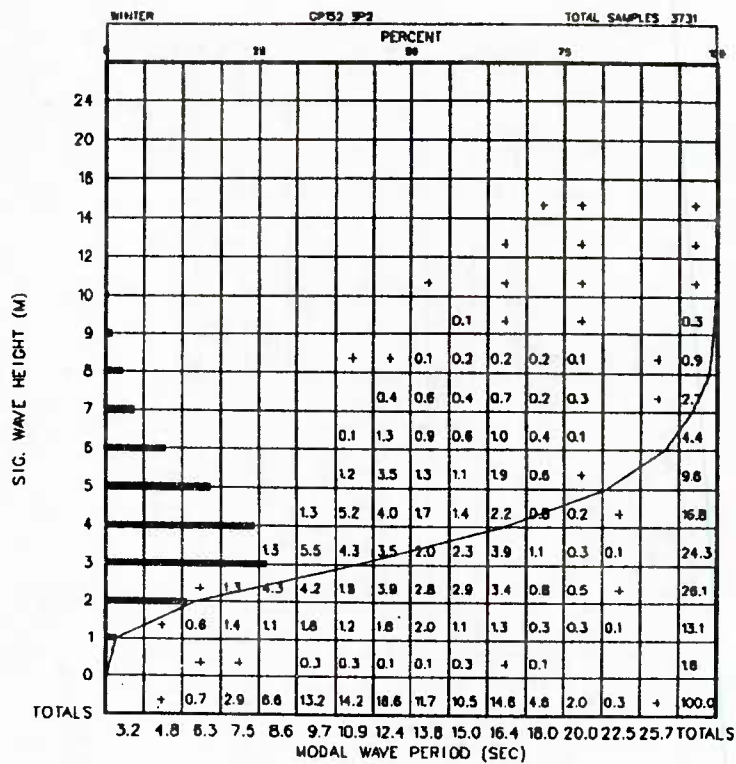


Figure A-152-2-1 Significant Wave Height vs. Modal Wave Period

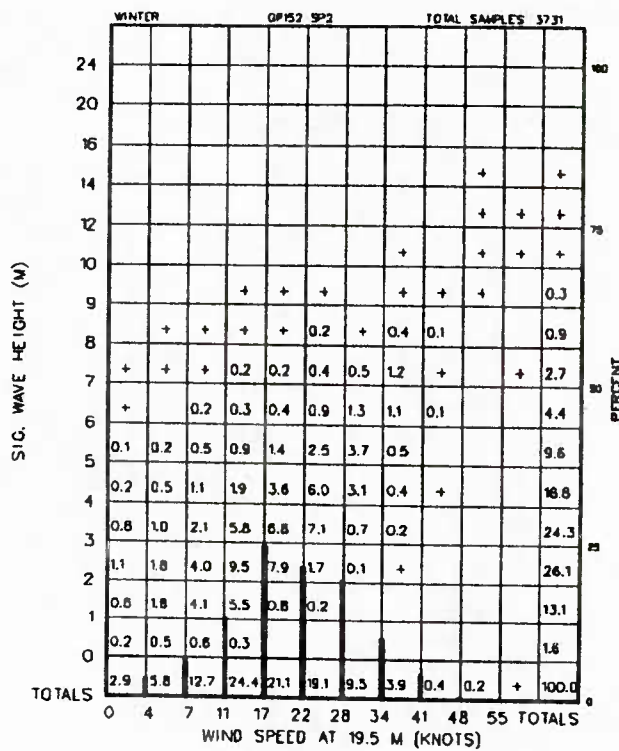


Figure A-152-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

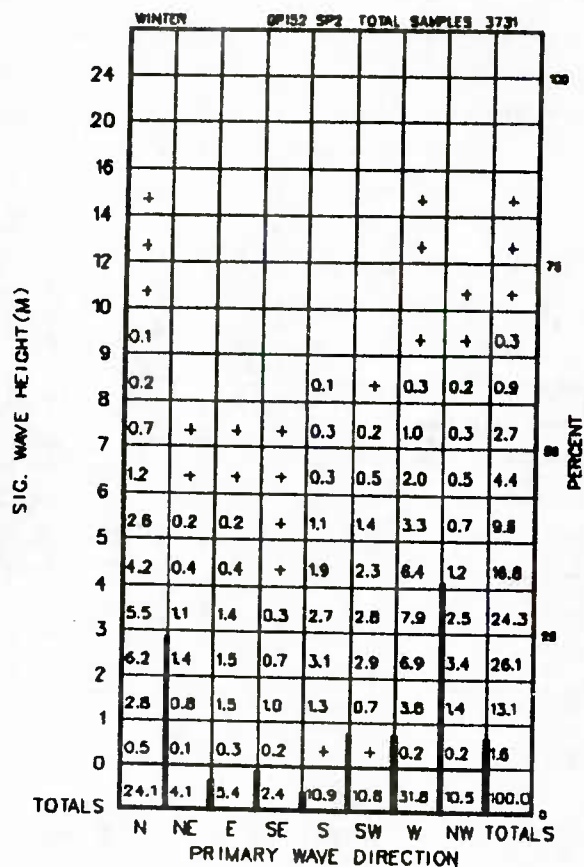


Figure A-152-2-3 Significant Wave Height vs. Primary Wave Direction

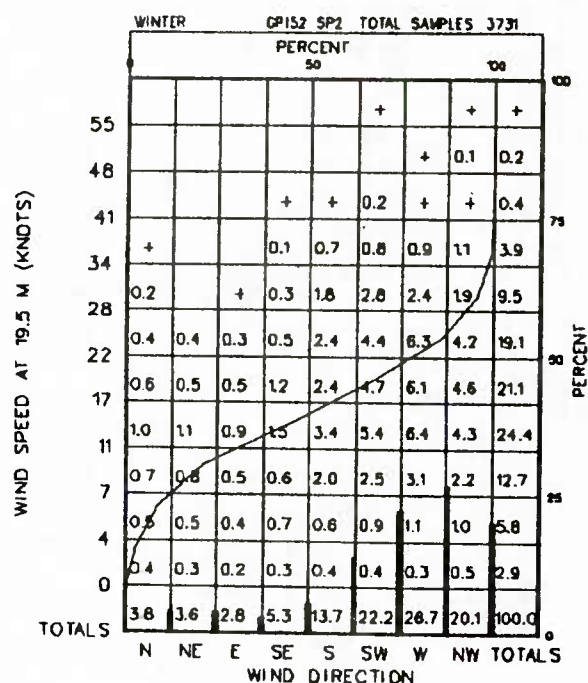


Figure A-152-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

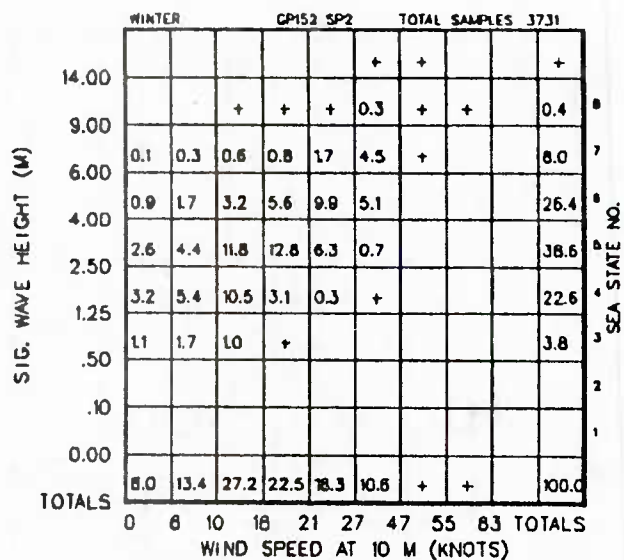


Figure A-152-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

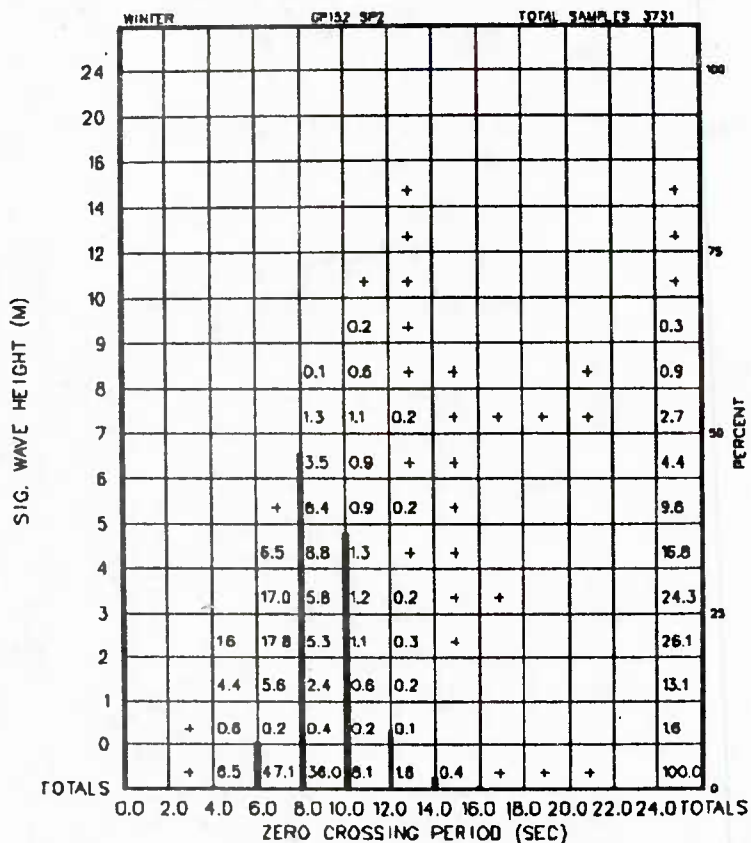


Figure A-152-2-6 Significant Wave Height vs. Zero Crossing Period

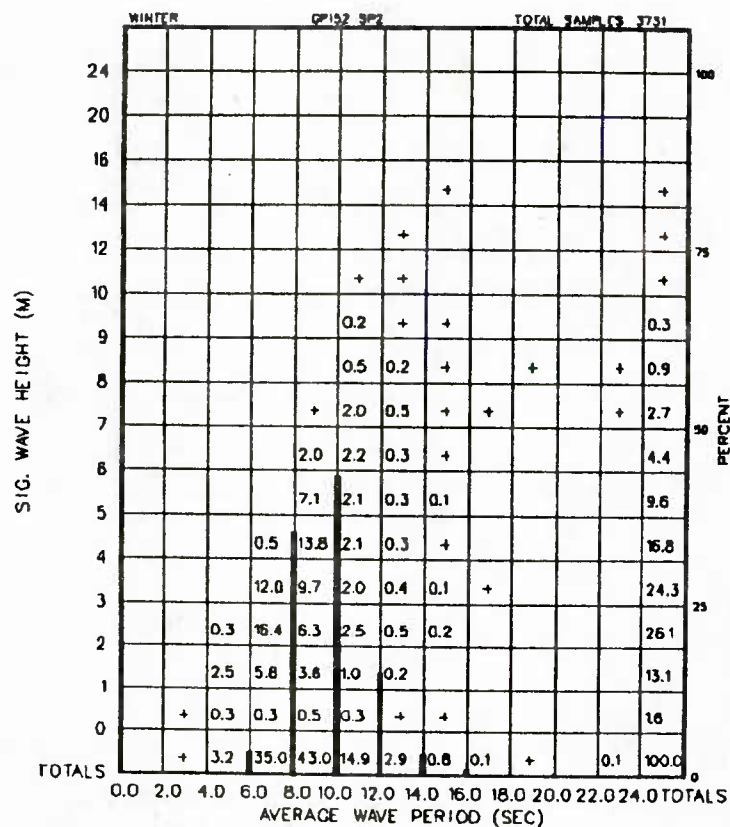


Figure A-152-2-7 Significant Wave Height vs. Average Wave Period

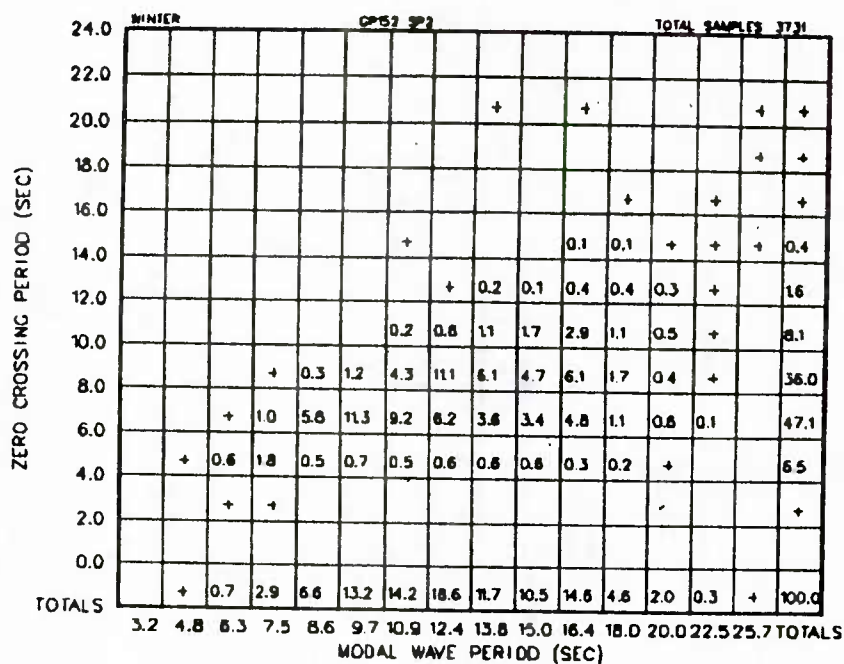


Figure A-152-2-8 Zero Crossing Period vs. Modal Wave Period

[illegible]

Figure A-152-2-9 Average Wave Period vs.
Modal Wave Period

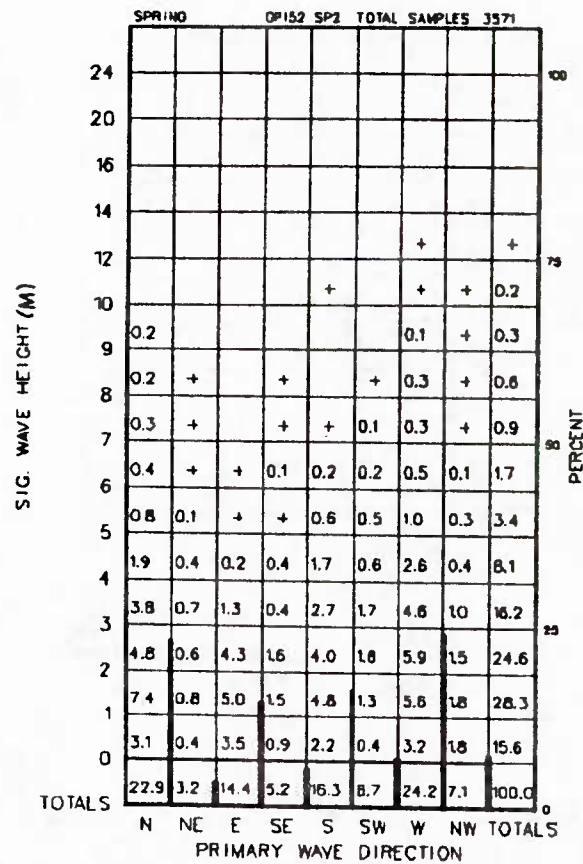


Figure A-152-3-3 Significant Wave Height vs. Primary Wave Direction

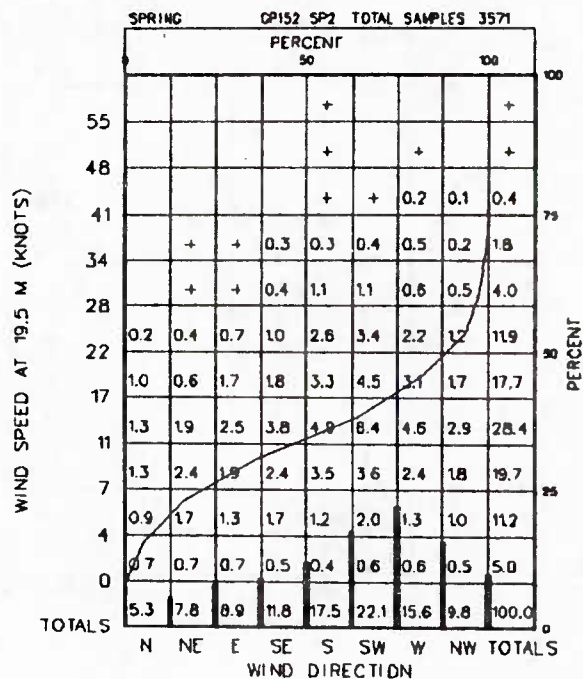


Figure A-152-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

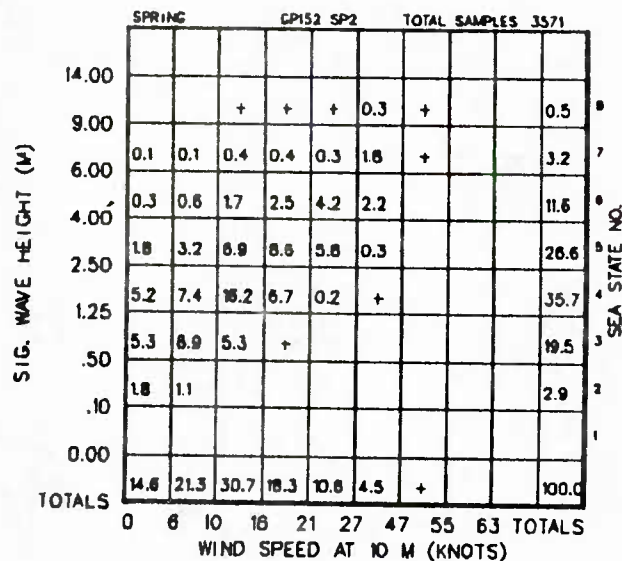


Figure A-152-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

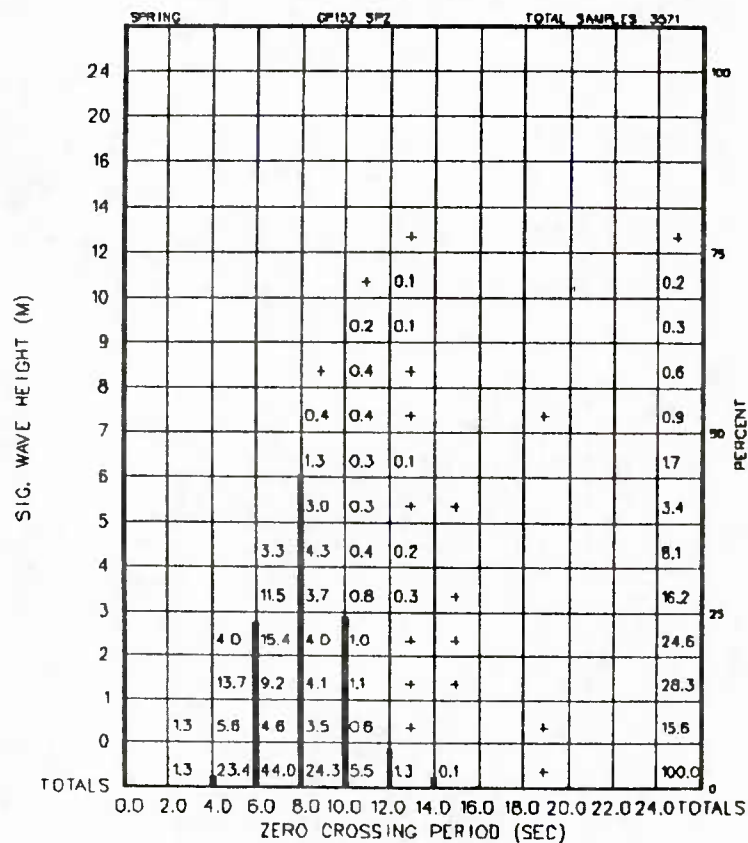


Figure A-152-3-6 Significant Wave Height vs. Zero Crossing Period

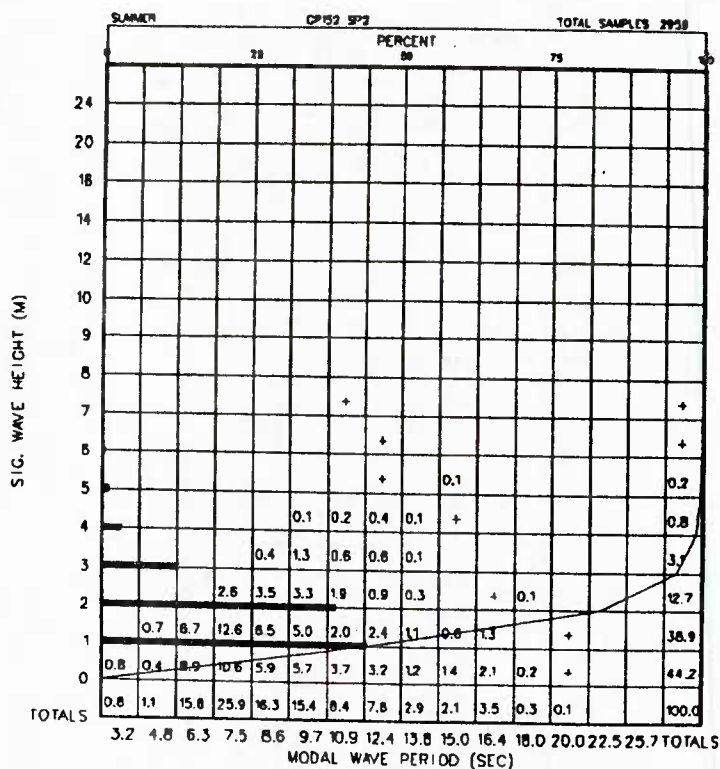


Figure A-152-4-1 Significant Wave Height vs. Modal Wave Period

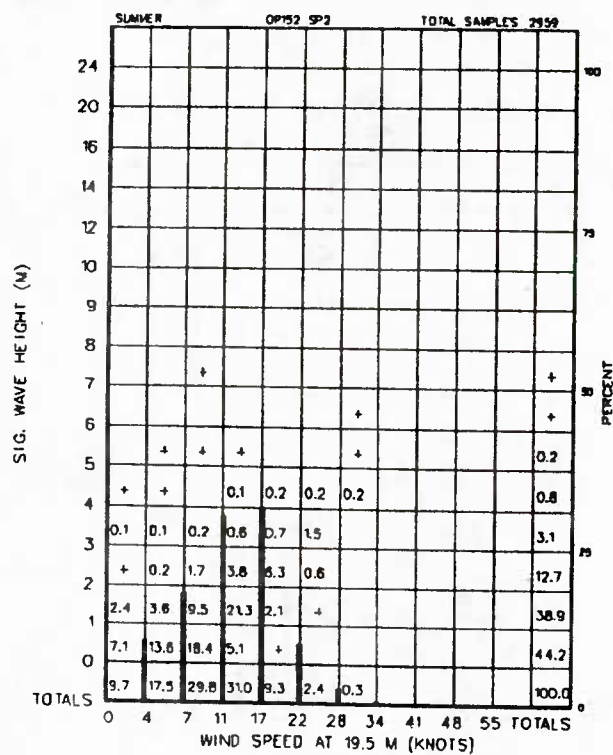


Figure A-152-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

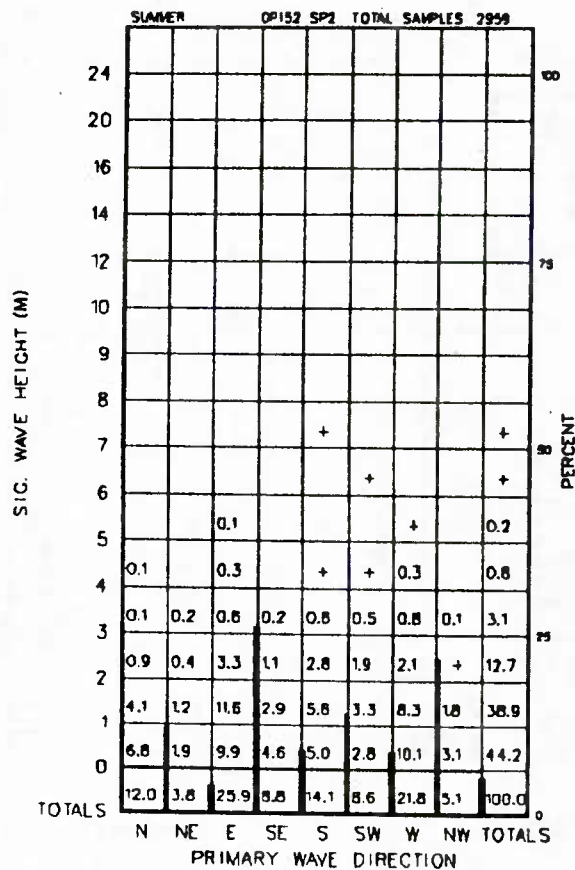


Figure A-152-4-3 Significant Wave Height vs. Primary Wave Direction

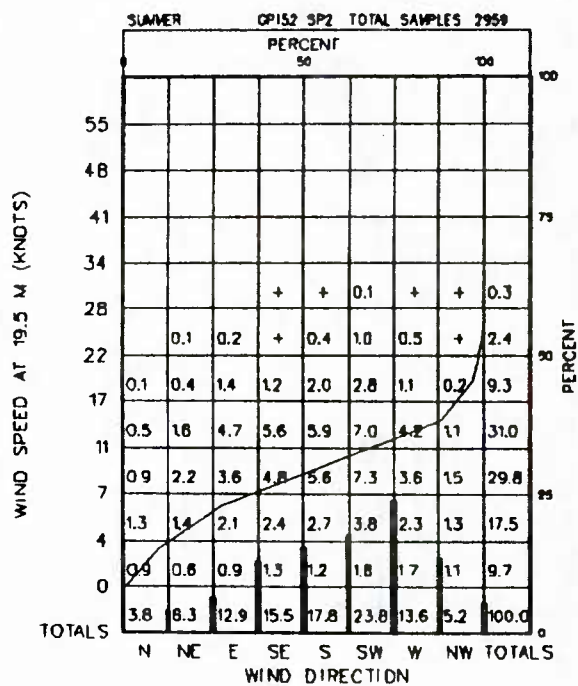


Figure A-152-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

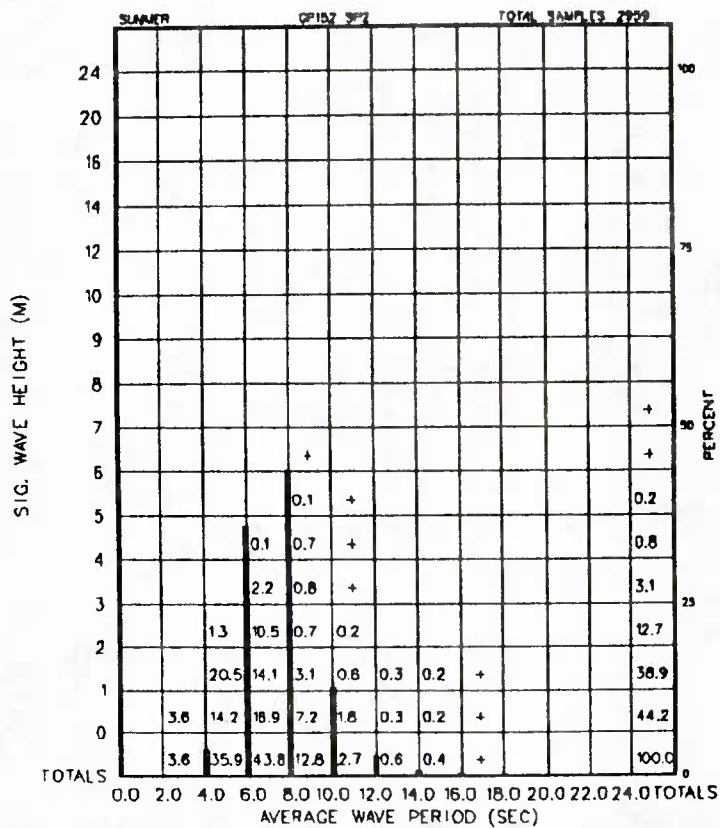


Figure A-152-4-7 Significant Wave Height vs. Average Wave Period

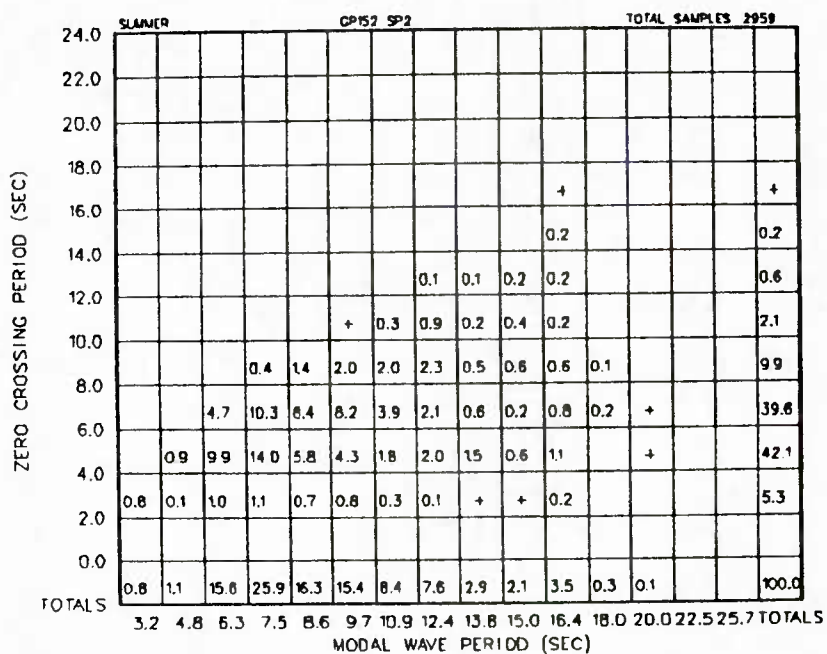


Figure A-152-4-8 Zero Crossing Period vs. Modal Wave Period

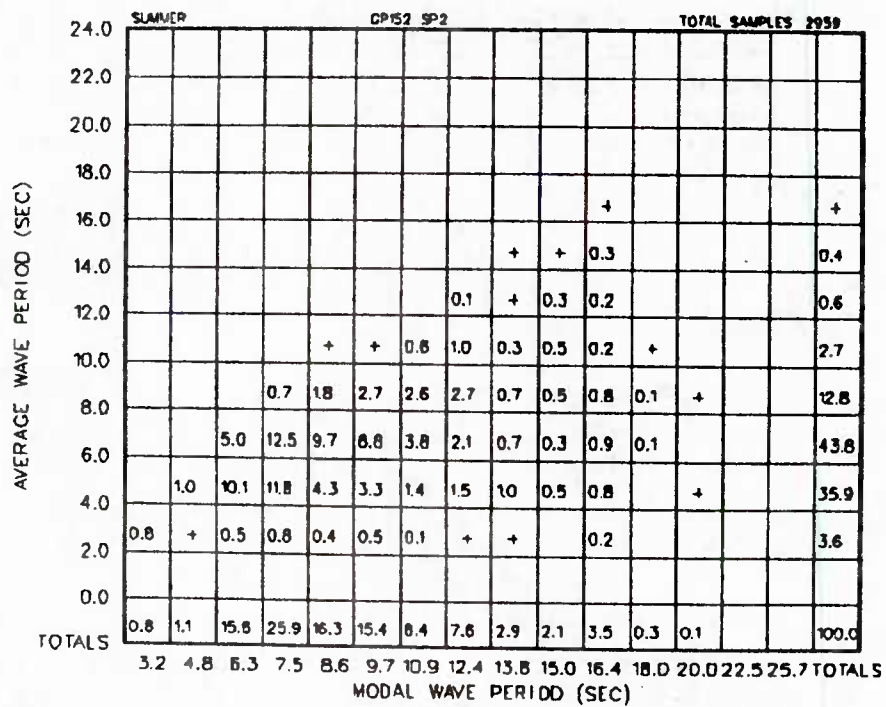


Figure A-152-4-9 Average Wave Period vs.
Modal Wave Period

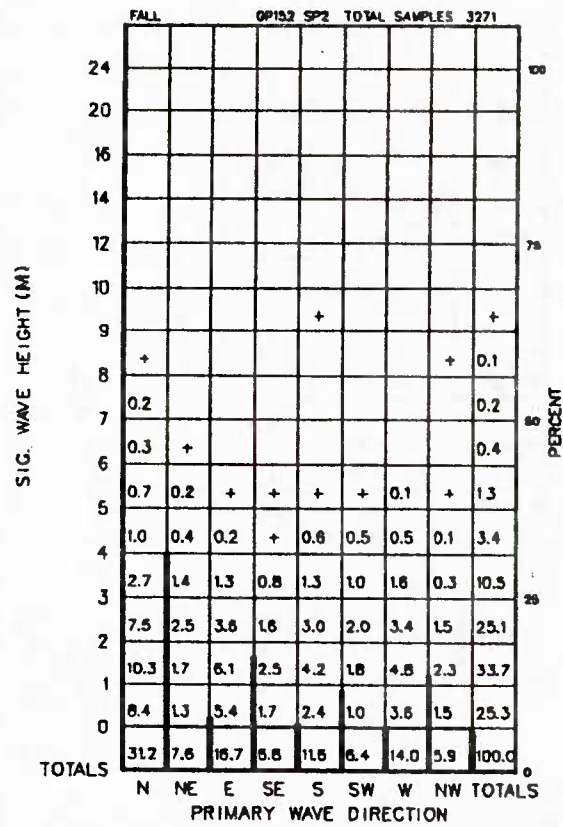


Figure A-152-5-3 Significant Wave Height vs. Primary Wave Direction

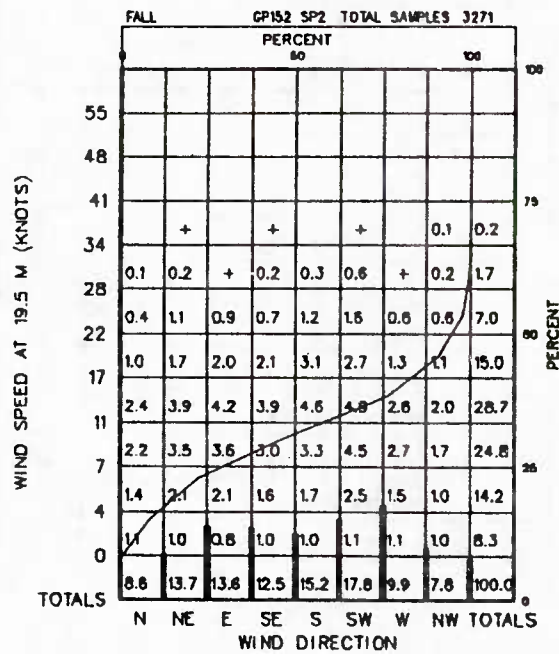
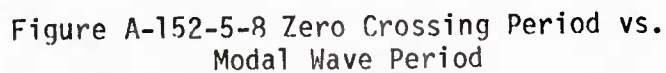
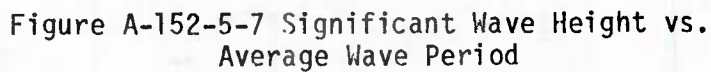


Figure A-152-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction





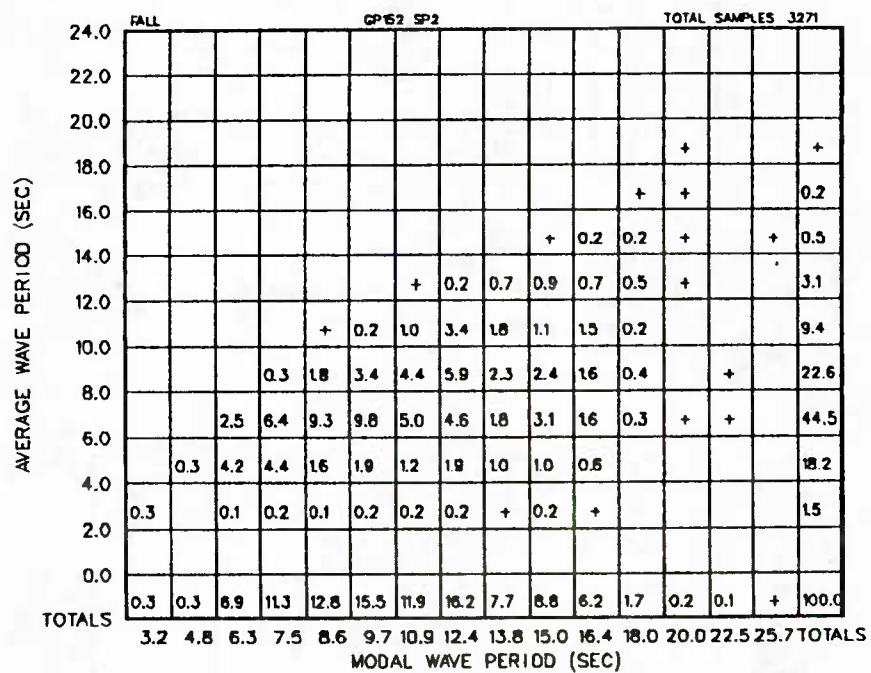


Figure A-152-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-165-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 25.19°N, 179.77°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	3.5 17 -	1.5 11 -	1.5 7.5 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.5 -	8.5 1.25 -	21 2.5 -	11 1.5 -	14 1.75 E
Visibility, nautical miles	7	20	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	5.5 3.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 8% of the time				
Relative Humidity, %	60	80	97	-	-
Air Temperature, °C	17	21	26	21	-
Sea Surface Temperature, °C	20	23	26	-	-
Sea Level Pressure, millibars	1008	1020	1028	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	352 - -	- 2% 2%

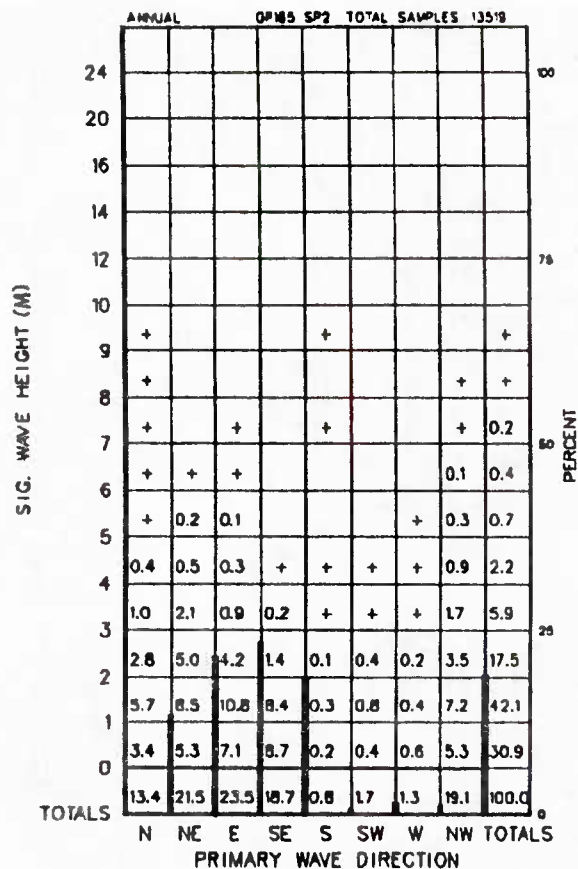


Figure A-165-1-3 Significant Wave Height vs. Primary Wave Direction

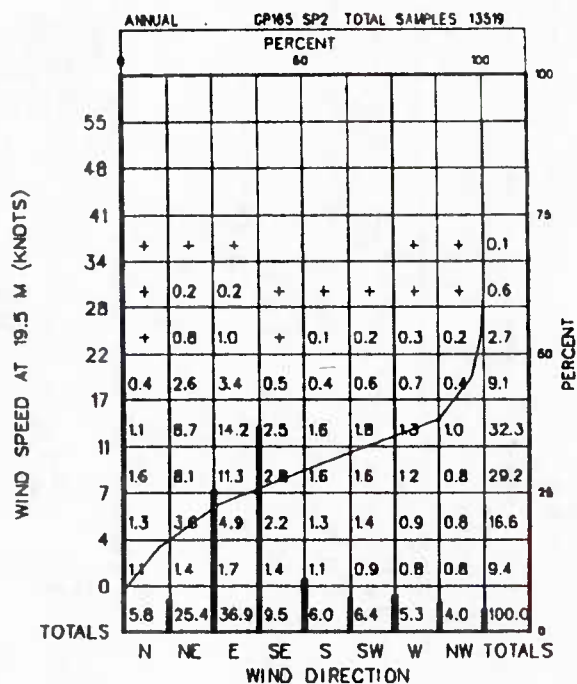


Figure A-165-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

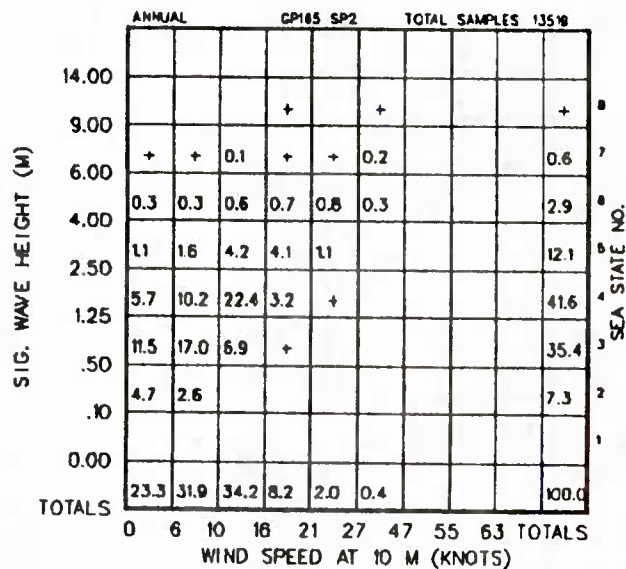


Figure A-165-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

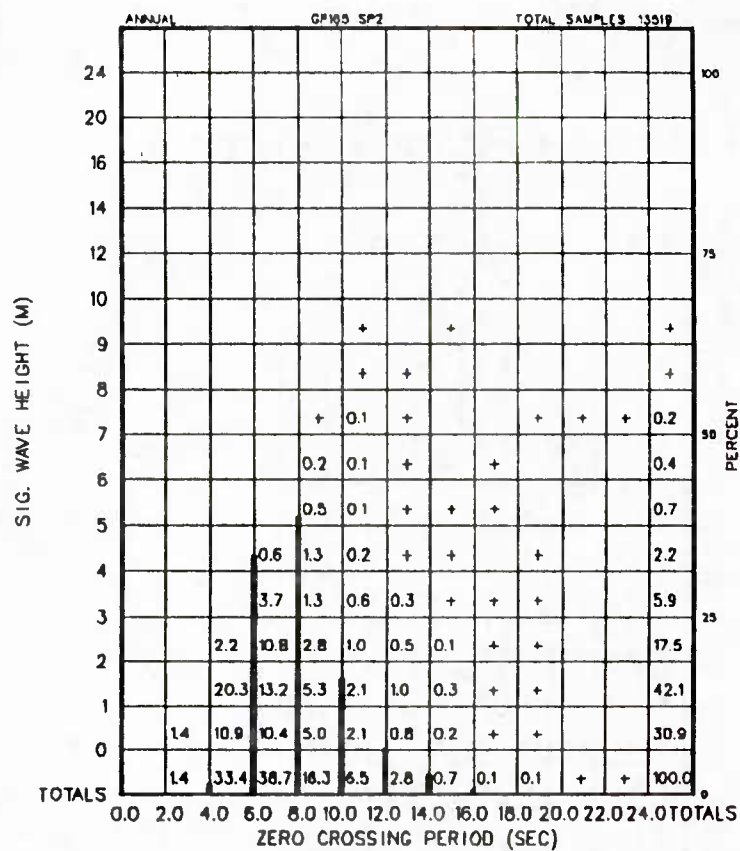
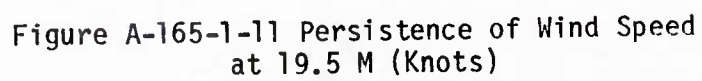


Figure A-165-1-6 Significant Wave Height vs. Zero Crossing Period



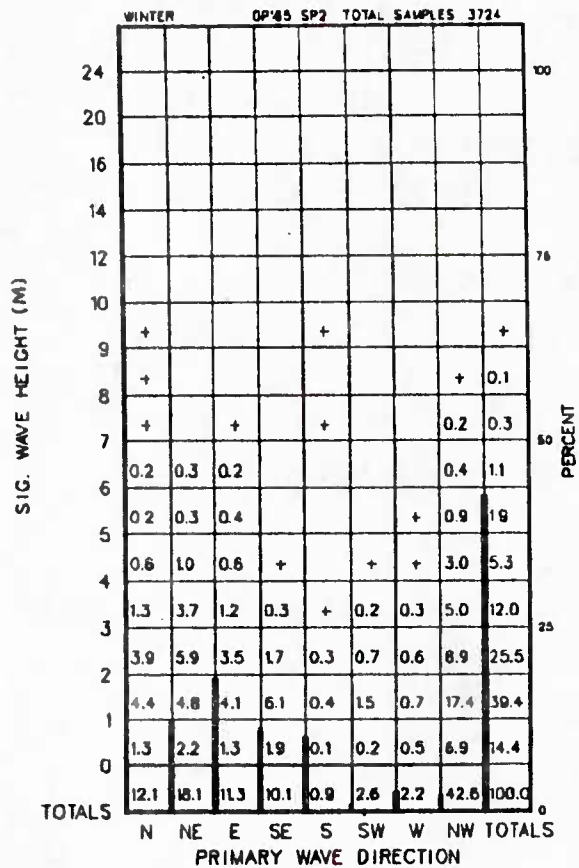


Figure A-165-2-3 Significant Wave Height vs. Primary Wave Direction

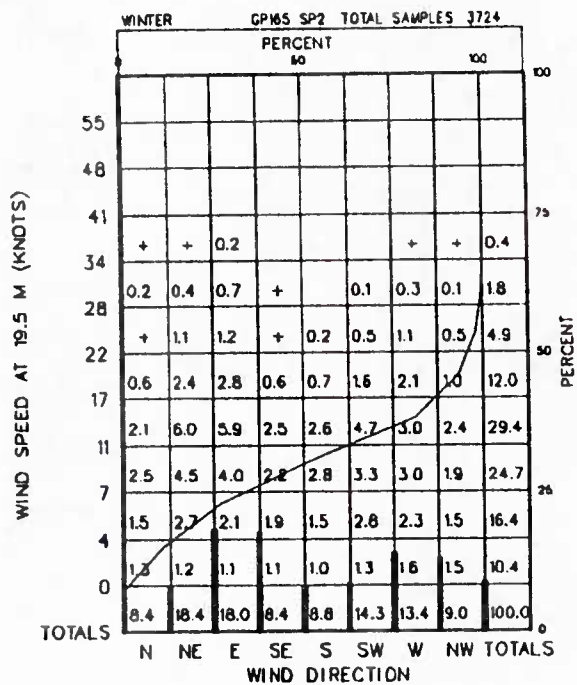
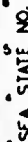


Figure A-165-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



WINTER GP165 SP2 TOTAL SAMPLES 3724

SIG. WAVE HEIGHT (M)

PERCENT

ZERO CROSSING PERIOD (SEC)

TOTALS

Zero Crossing Period (Sec)	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
0	0.2	3.6	3.0	4.3	2.3	0.7	0.2		+					14.4
1		9.7	13.8	9.6	4.4	1.6	0.3	+						39.4
2			1.5	14.9	5.6	1.9	1.2	0.4						25.5
3				6.8	2.9	1.5	0.7	0.1	+					12.0
4				14	3.0	0.6	0.2	+						5.3
5					1.4	0.2	0.2		+					1.9
6					0.6	0.3	0.1			+				1.1
7						0.2						+		0.3
8							+							0.1
9								+						
10														
12														
14														
16														
20														
24														
TOTALS	0.2	14.8	38.9	27.4	11.5	4.8	1.1	0.2	+			+		100.0

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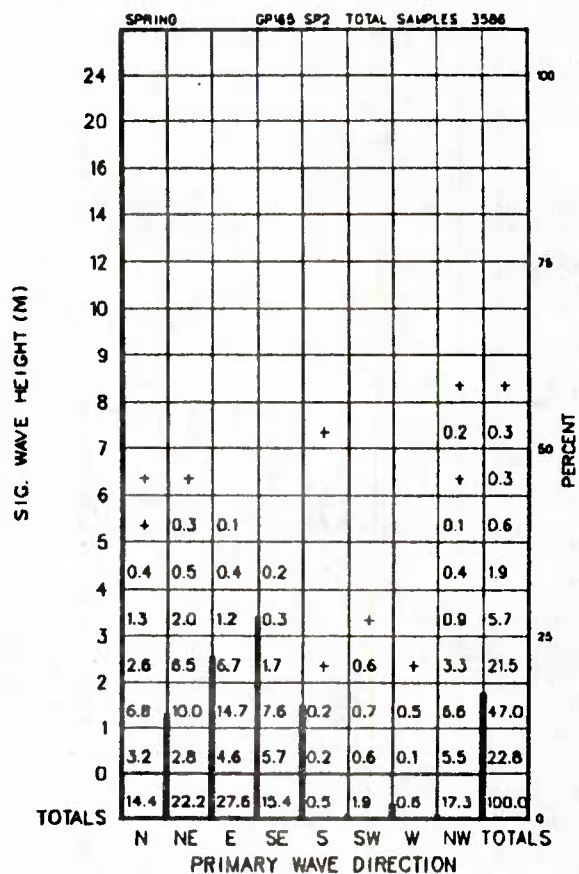


Figure A-165-3-3 Significant Wave Height vs. Primary Wave Direction

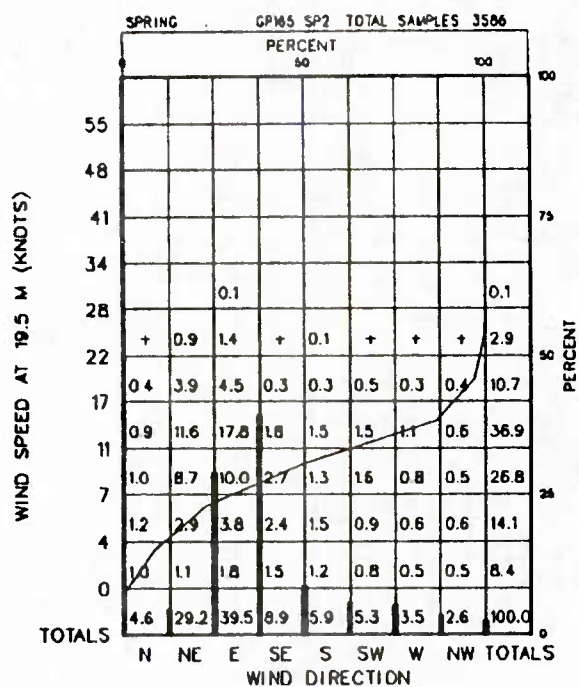


Figure A-165-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

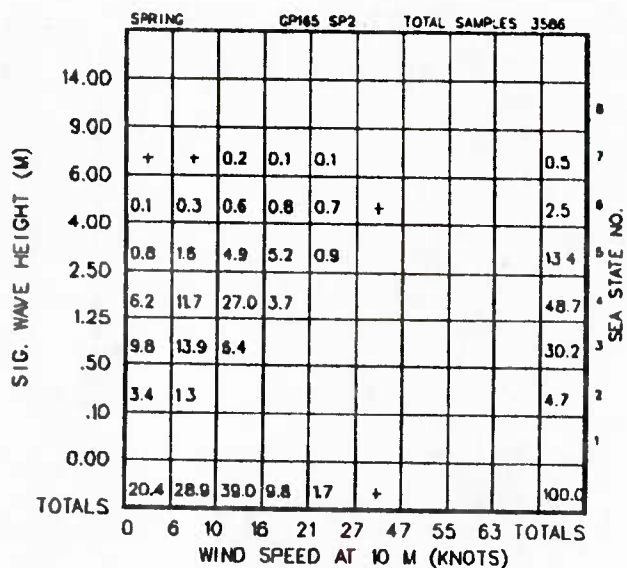


Figure A-165-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

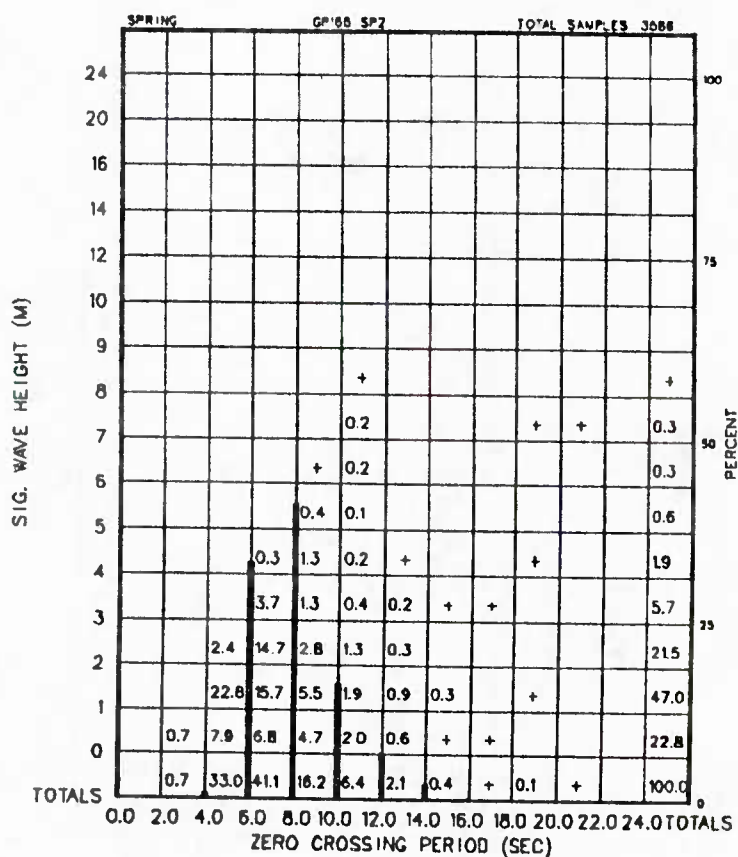


Figure A-165-3-6 Significant Wave Height vs. Zero Crossing Period

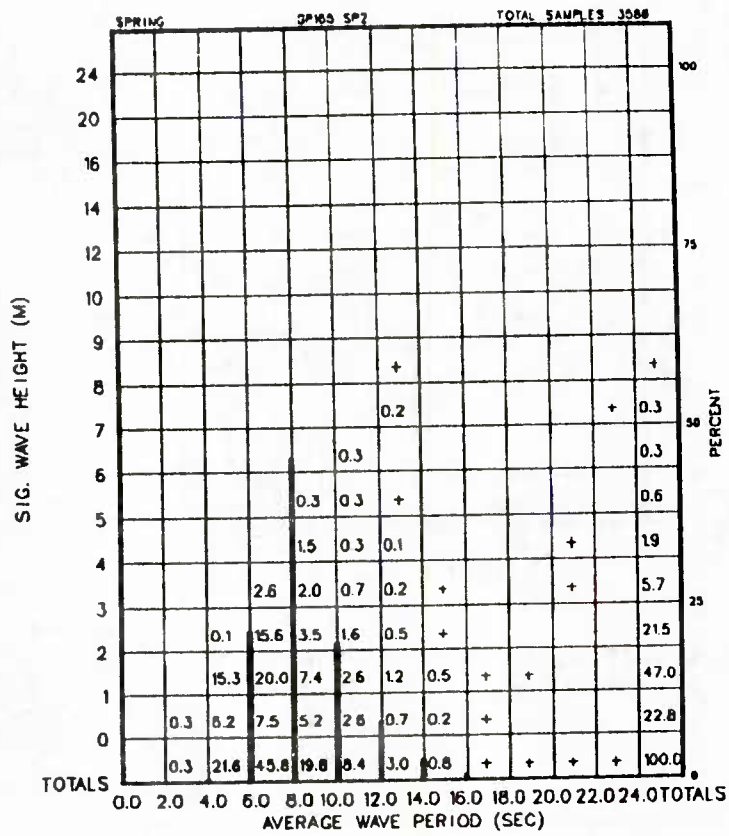


Figure A-165-3-7 Significant Wave Height vs. Average Wave Period

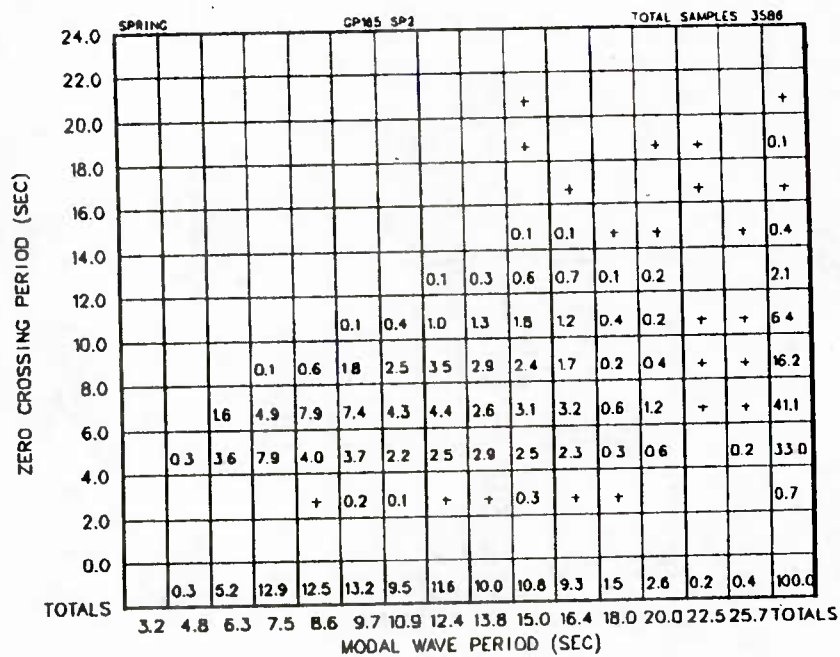


Figure A-165-3-8 Zero Crossing Period vs. Modal Wave Period

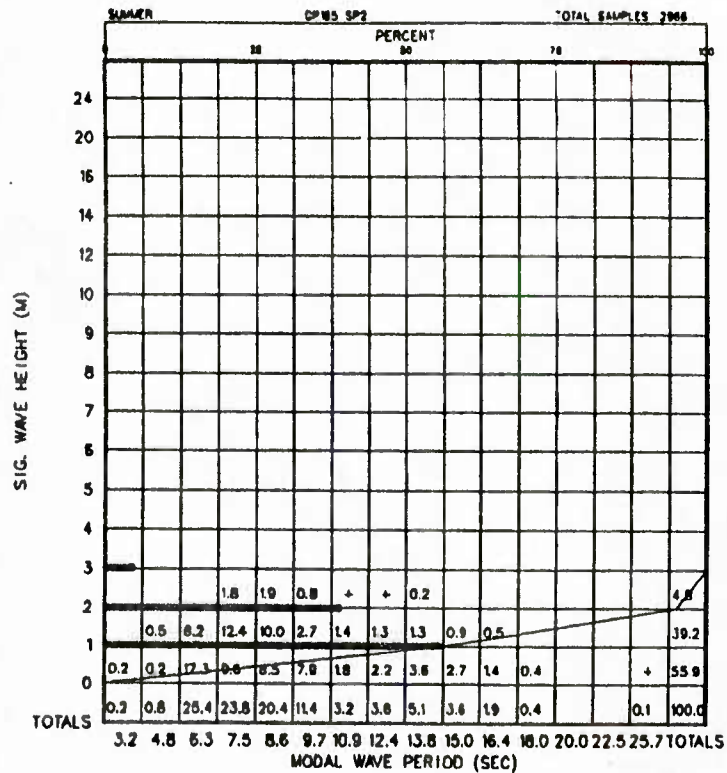


Figure A-165-4-1 Significant Wave Height vs. Modal Wave Period

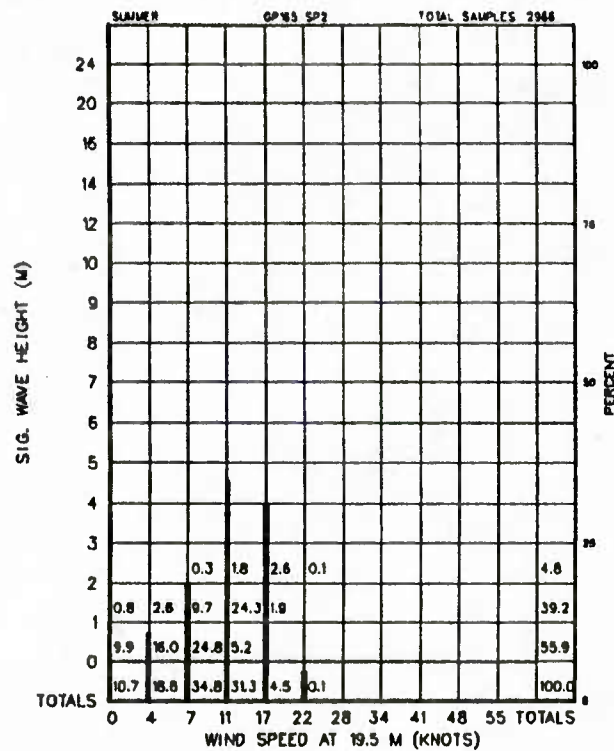


Figure A-165-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

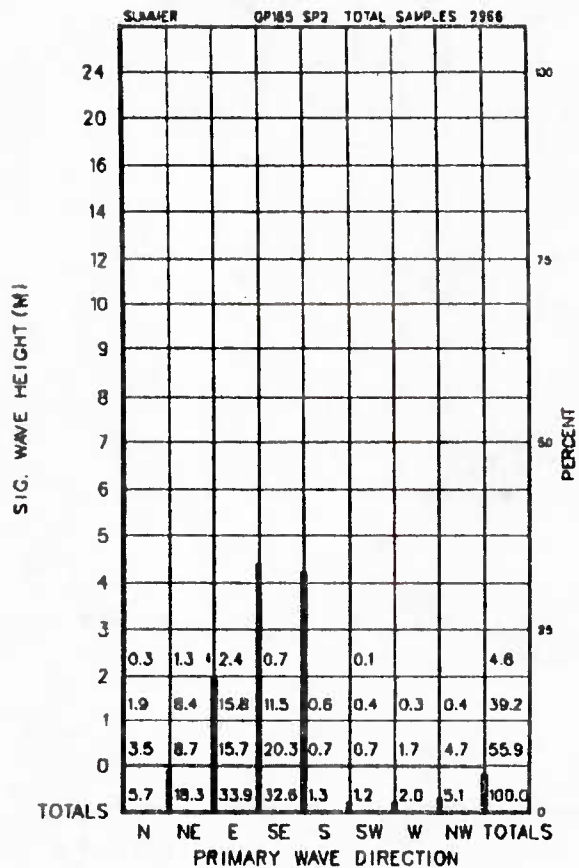


Figure A-165-4-3 Significant Wave Height vs. Primary Wave Direction

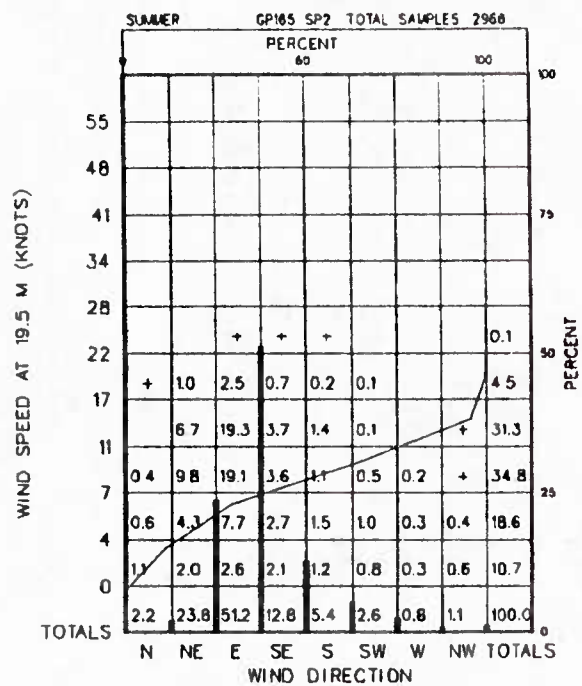


Figure A-165-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

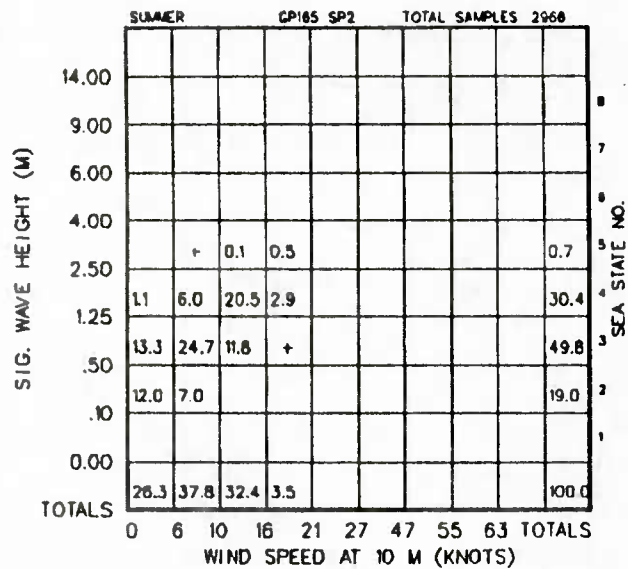


Figure A-165-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

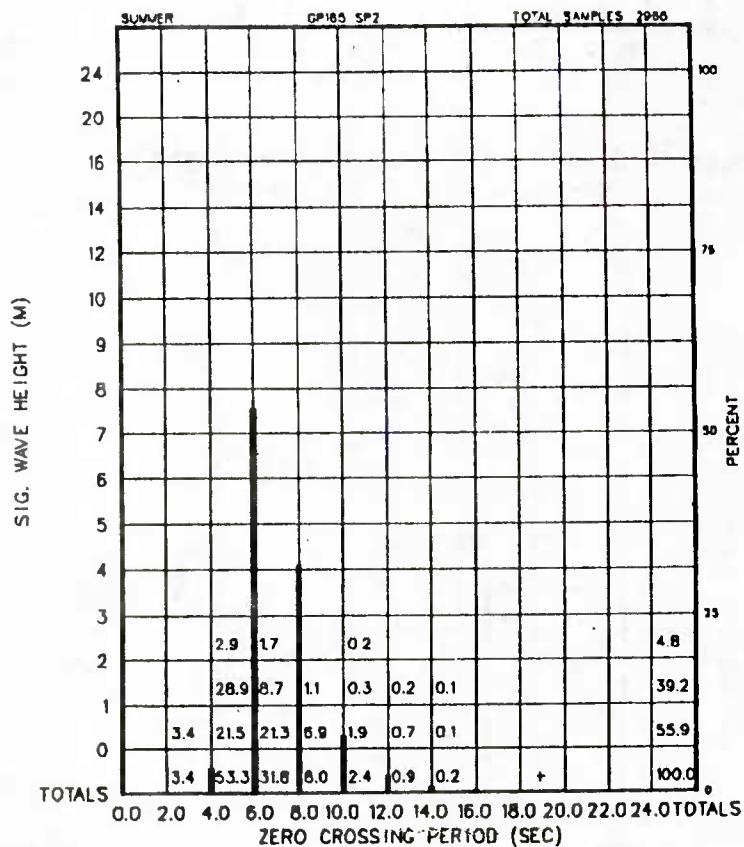


Figure A-165-4-6 Significant Wave Height vs. Zero Crossing Period

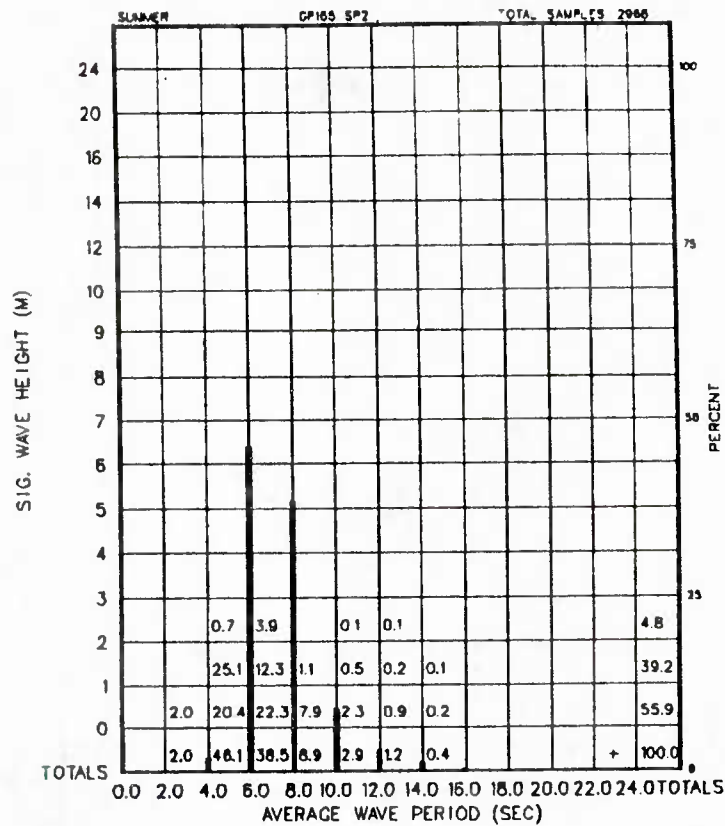


Figure A-165-4-7 Significant Wave Height vs. Average Wave Period

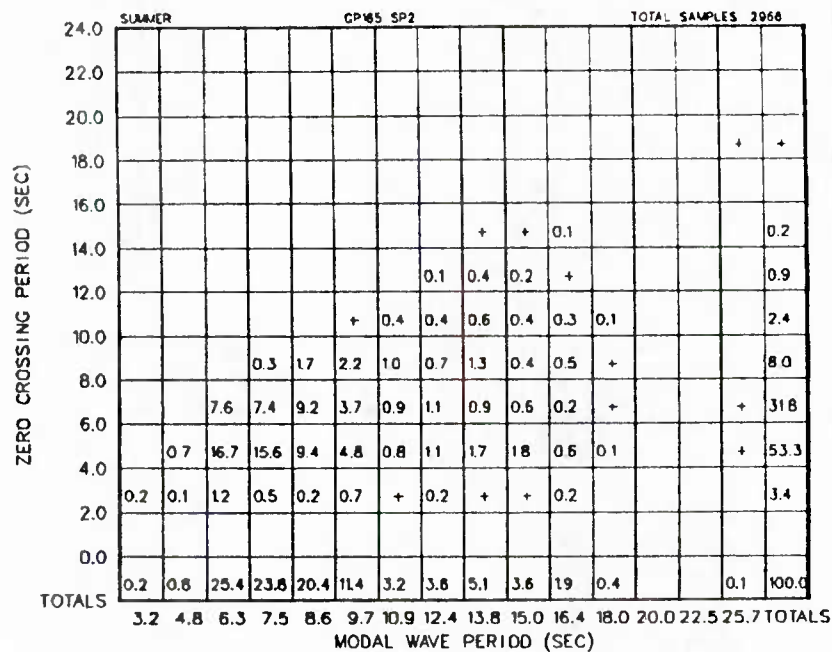
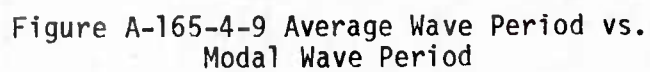


Figure A-165-4-8 Zero Crossing Period vs. Modal Wave Period



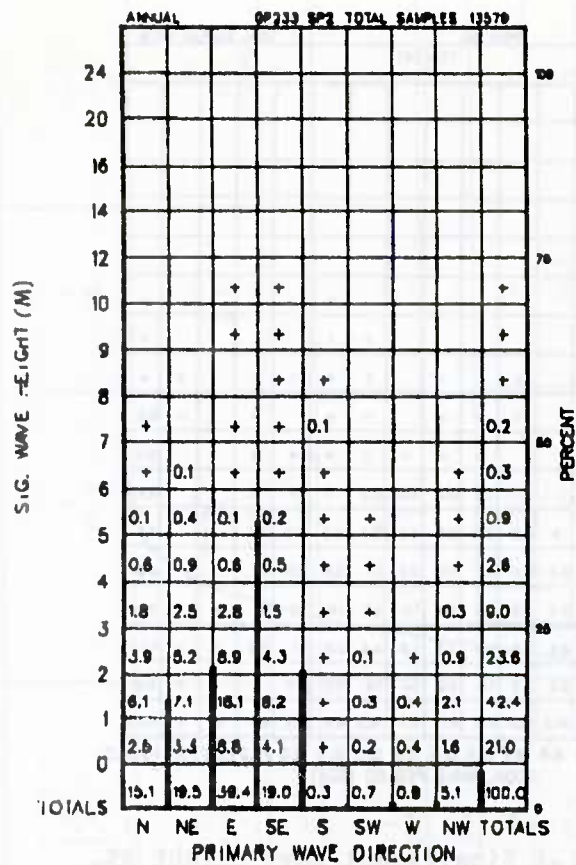


Figure A-233-1-3 Significant Wave Height vs. Primary Wave Direction

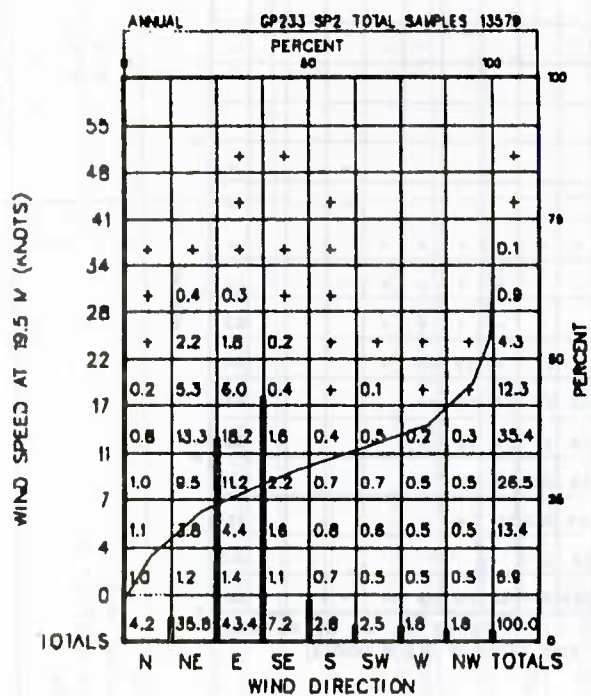


Figure A-233-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

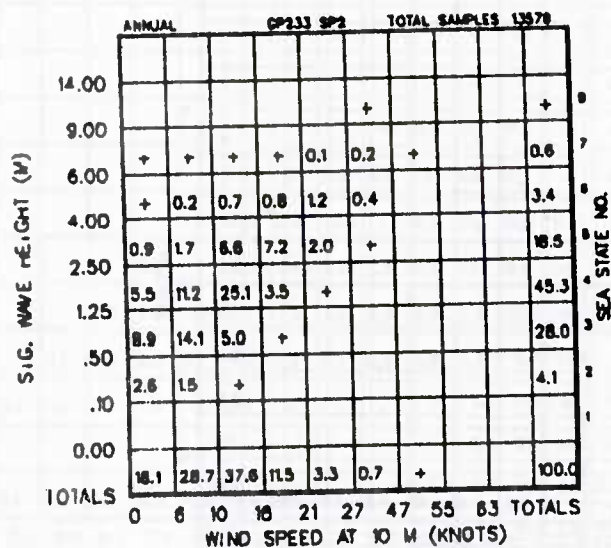


Figure A-233-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

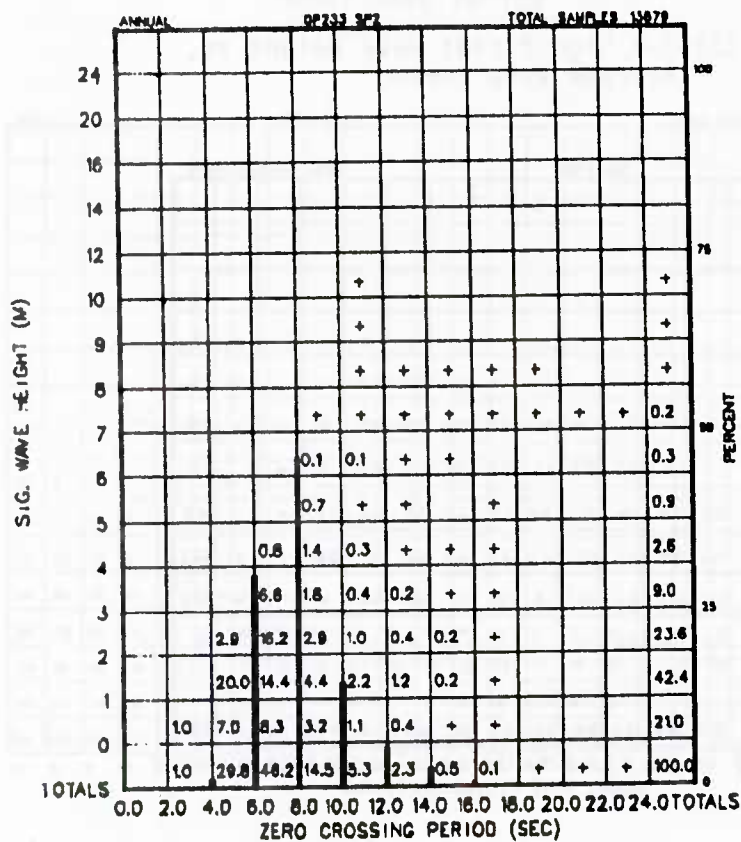


Figure A-233-1-6 Significant Wave Height vs. Zero Crossing Period

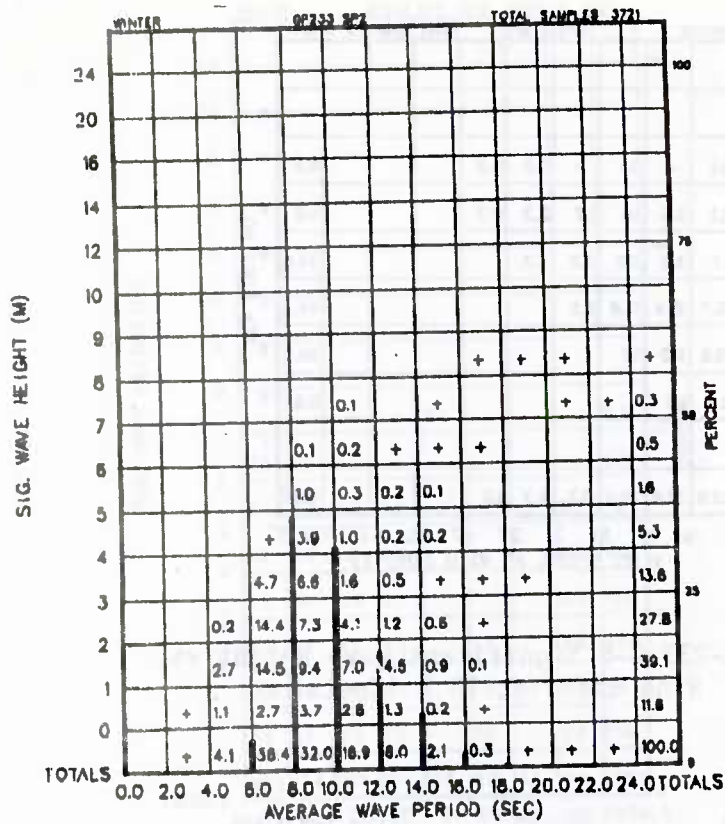


Figure A-233-2-7 Significant Wave Height vs. Average Wave Period

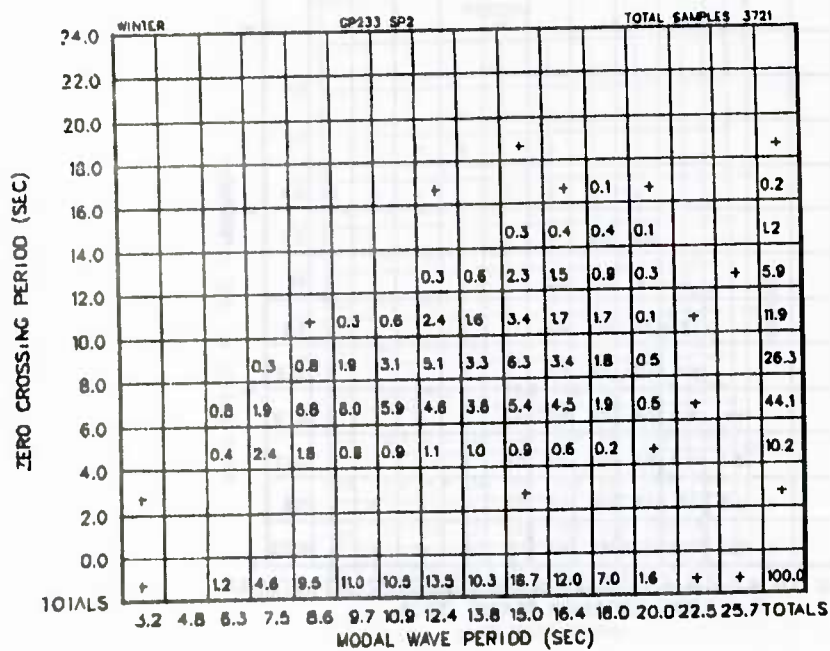


Figure A-233-2-8 Zero Crossing Period vs. Modal Wave Period

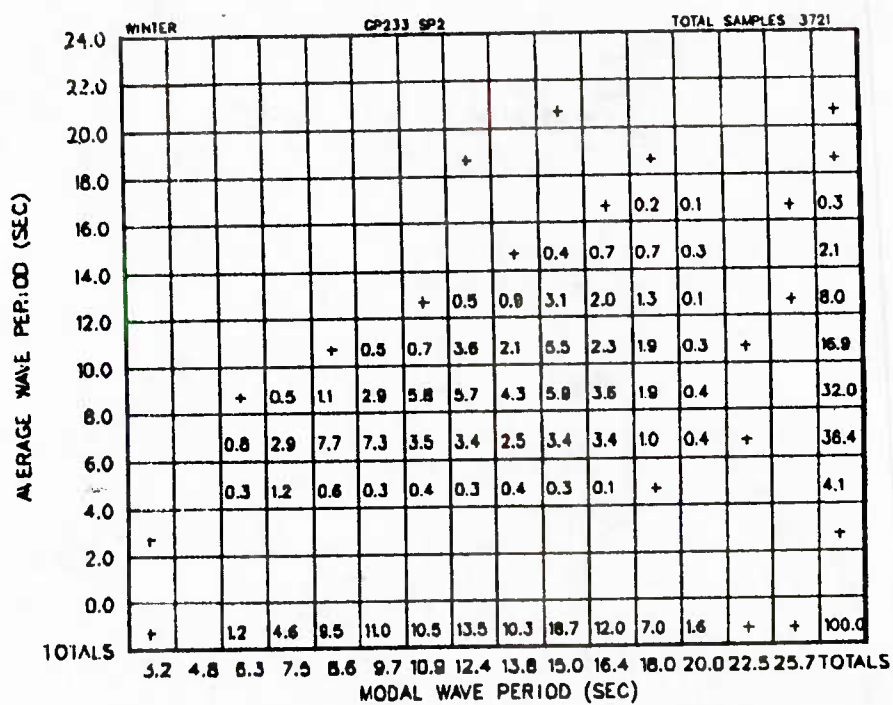


Figure A-233-2-9 Average Wave Period vs.
Modal Wave Period

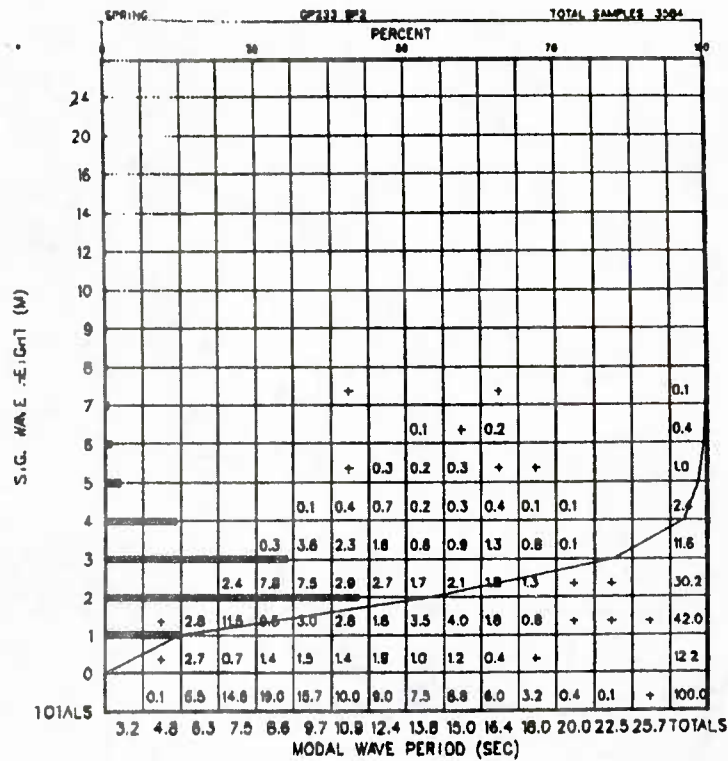


Figure A-233-3-1 Significant Wave Height vs. Modal Wave Period

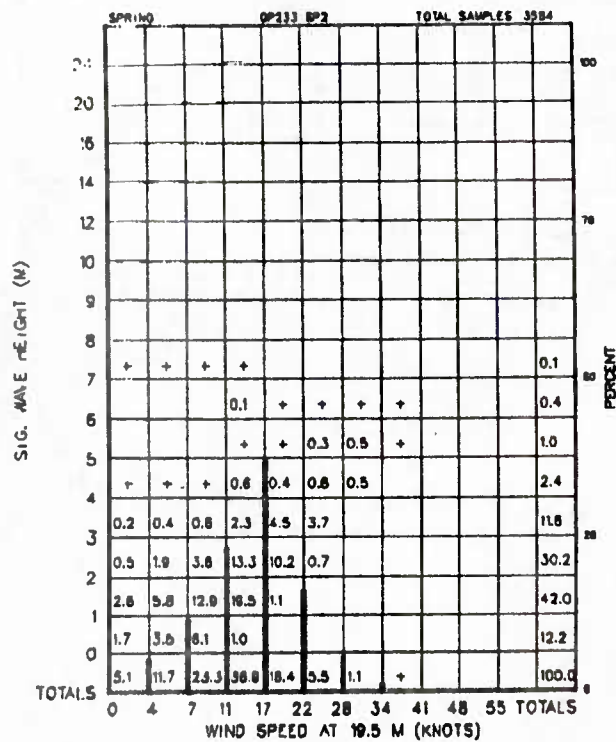


Figure A-233-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

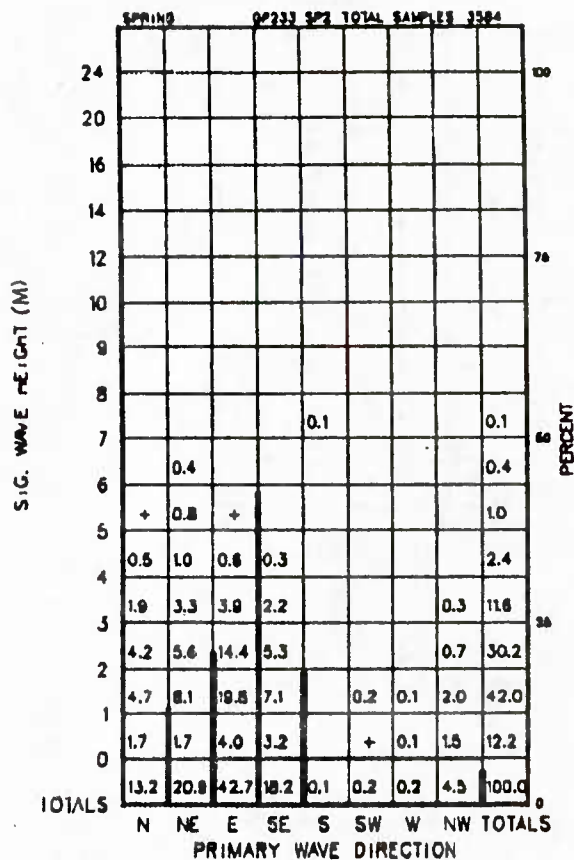


Figure A-233-3-3 Significant Wave Height vs. Primary Wave Direction

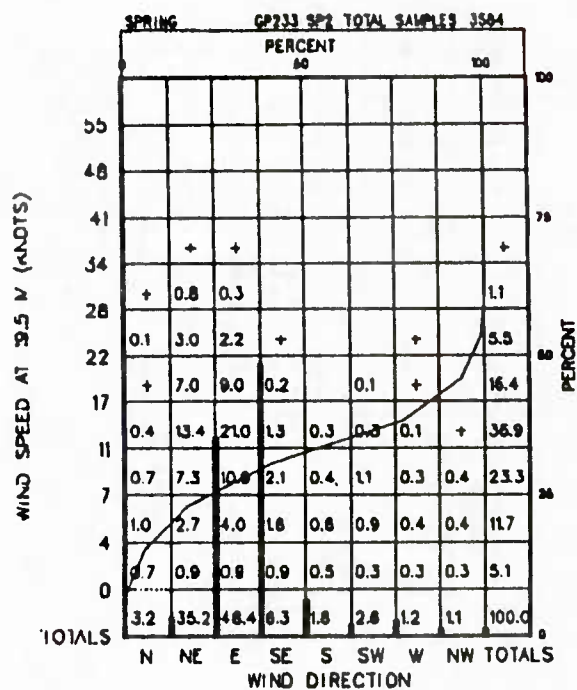


Figure A-233-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

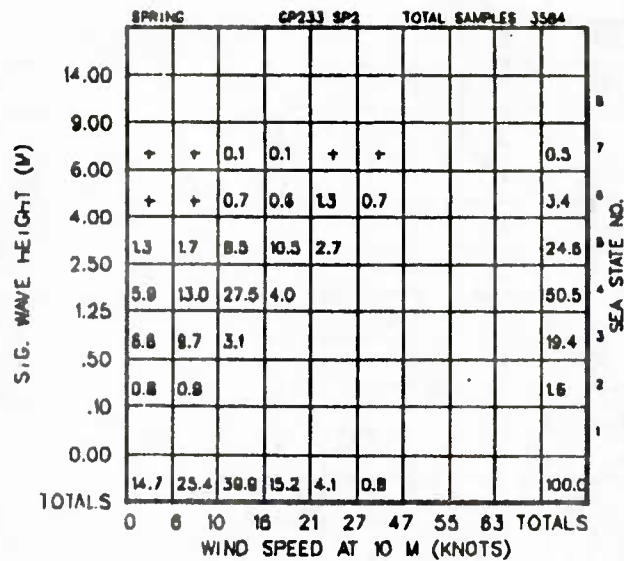


Figure A-233-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

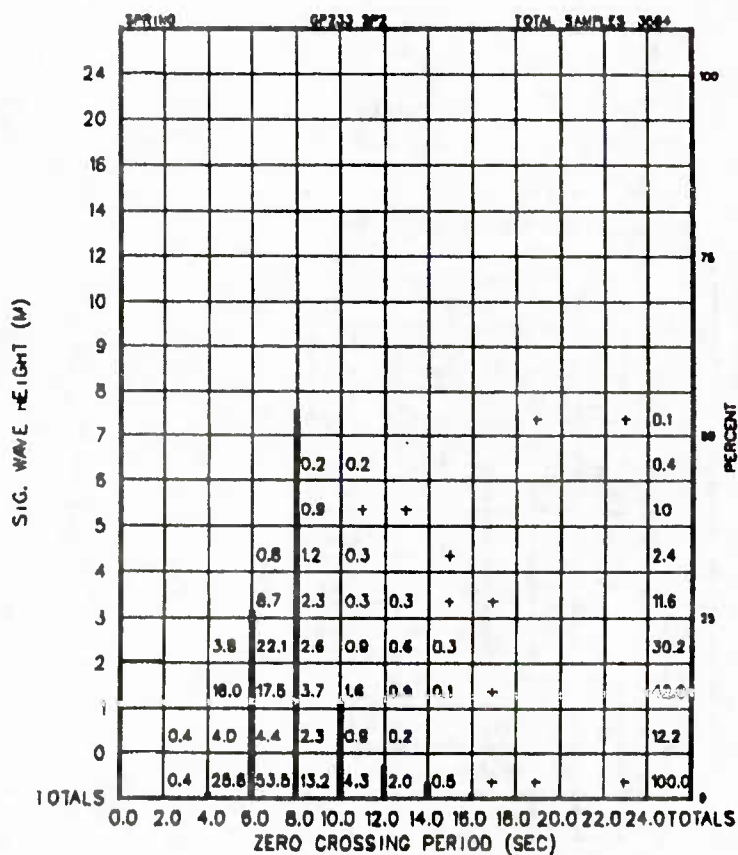


Figure A-233-3-6 Significant Wave Height vs. Zero Crossing Period

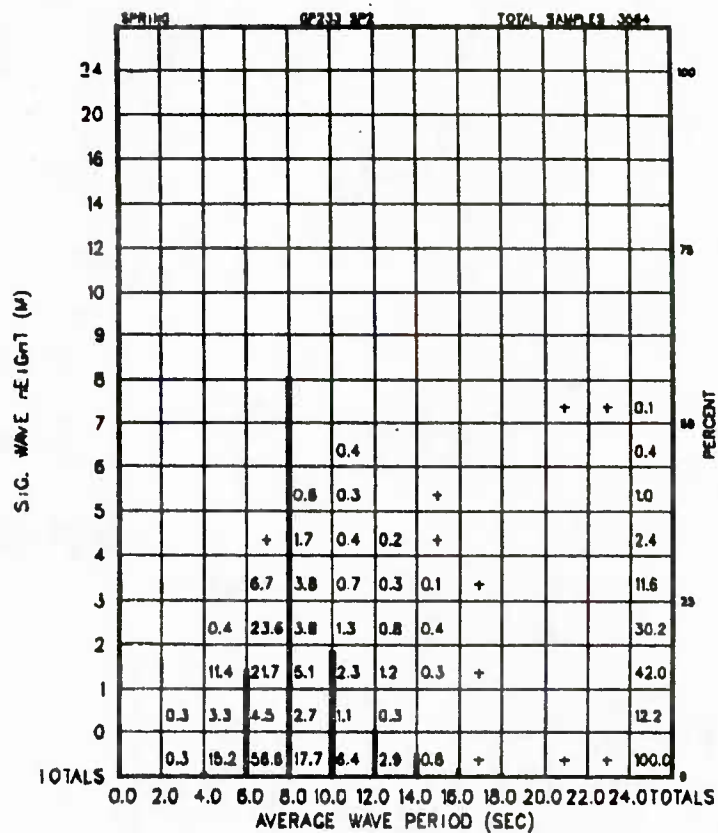


Figure A-233-3-7 Significant Wave Height vs. Average Wave Period

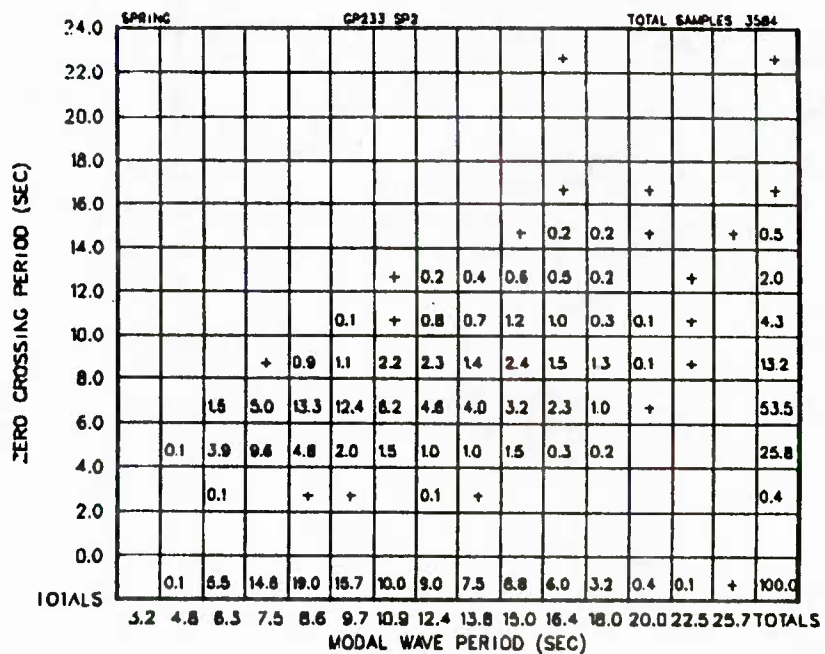


Figure A-233-3-8 Zero Crossing Period vs. Modal Wave Period

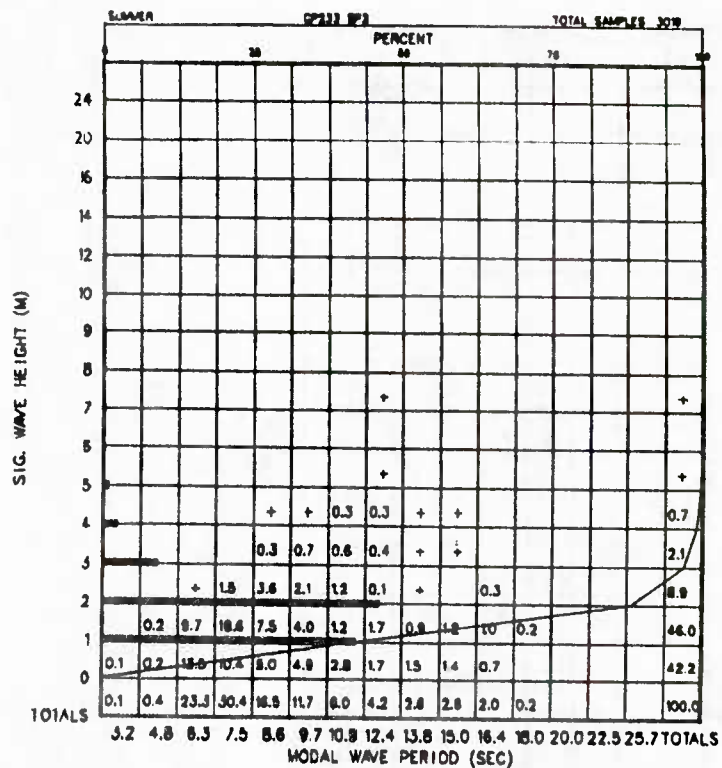


Figure A-233-4-1 Significant Wave Height vs. Modal Wave Period

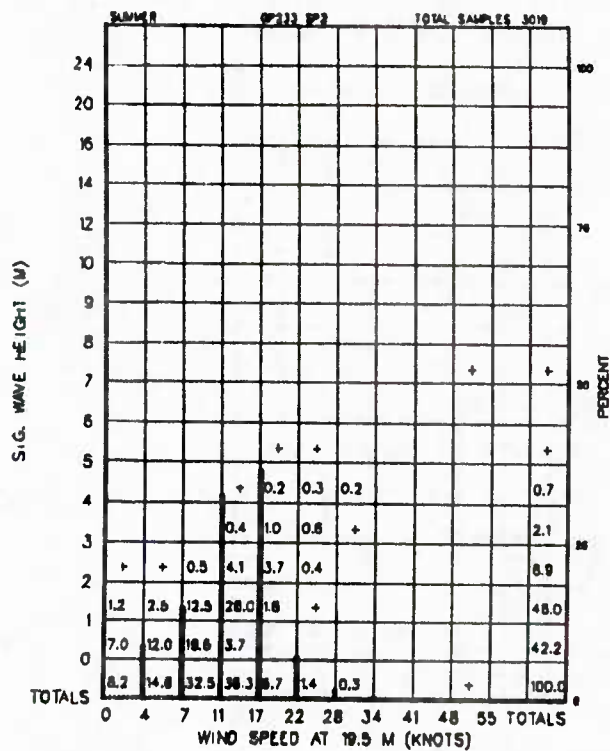


Figure A-233-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

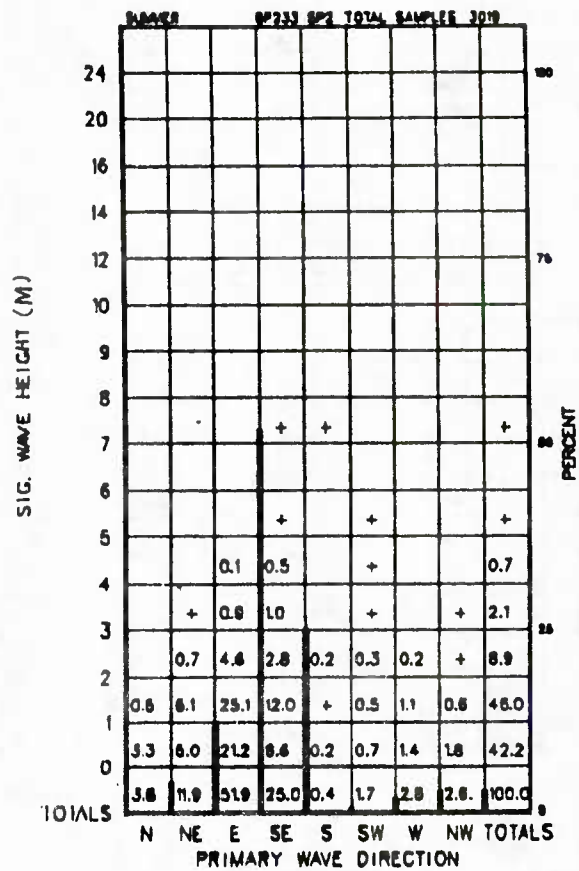


Figure A-233-4-3 Significant Wave Height vs. Primary Wave Direction

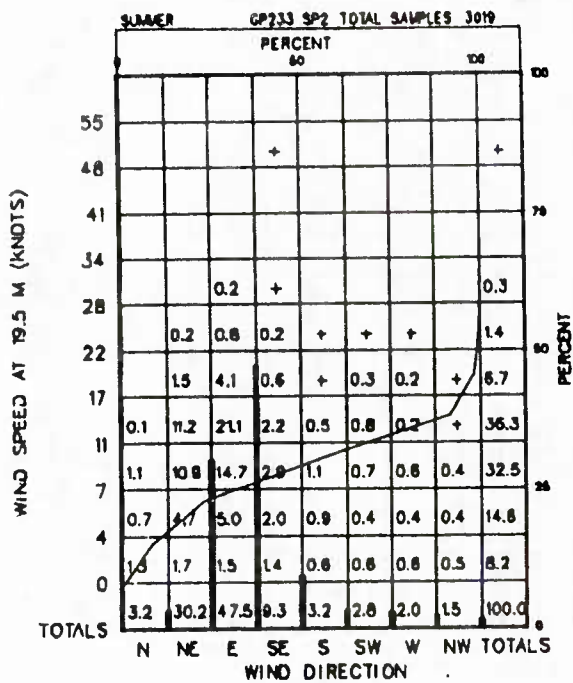


Figure A-233-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

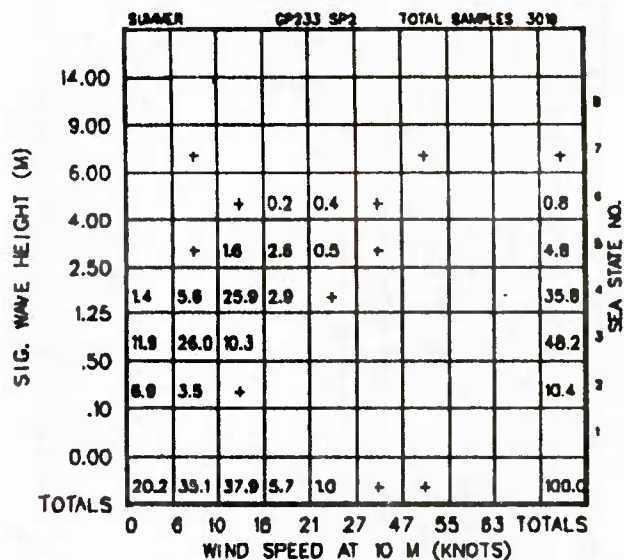


Figure A-233-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

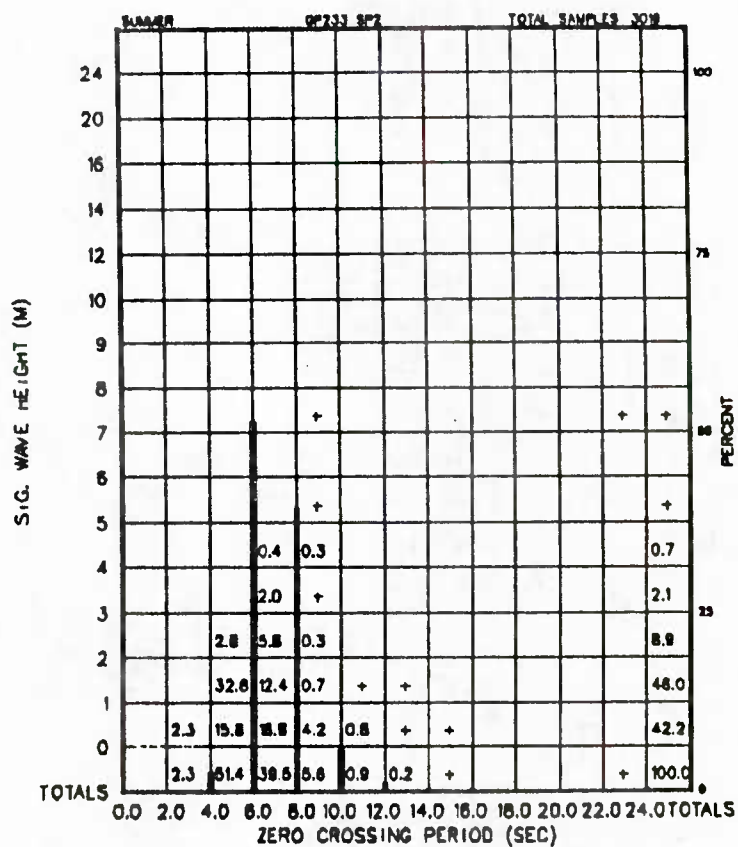


Figure A-233-4-6 Significant Wave Height vs. Zero Crossing Period

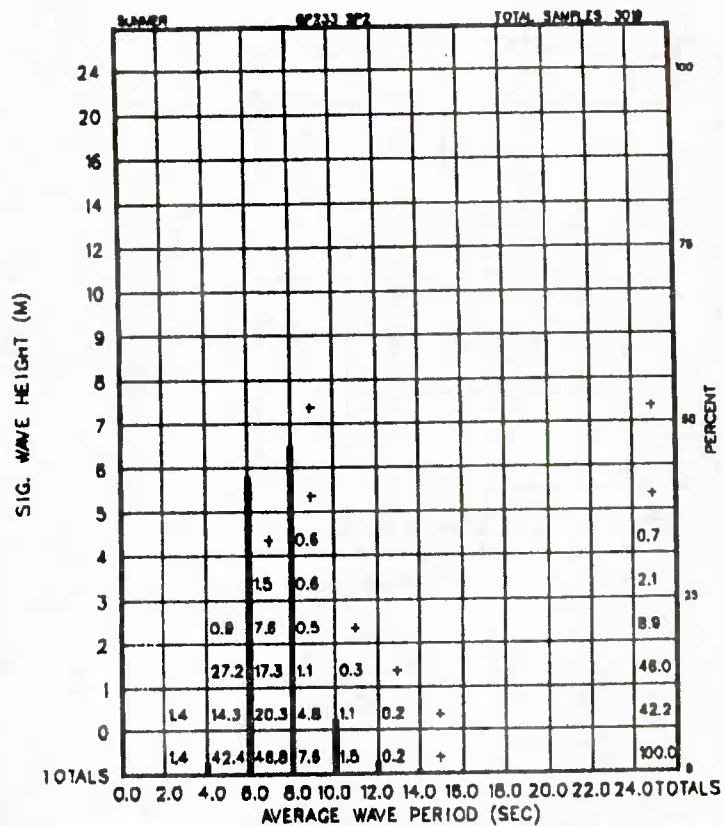


Figure A-233-4-7 Significant Wave Height vs. Average Wave Period

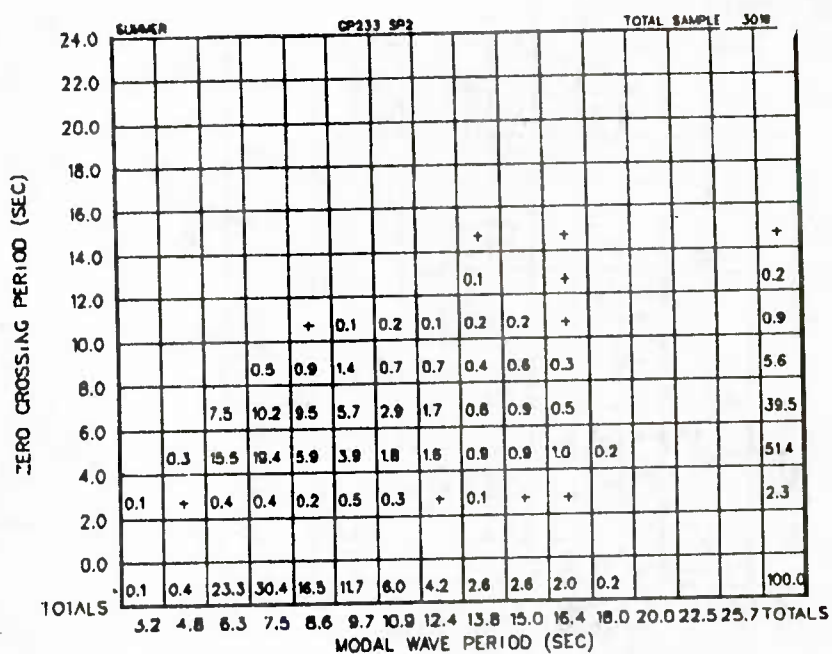


Figure A-233-4-8 Zero Crossing Period vs. Modal Wave Period

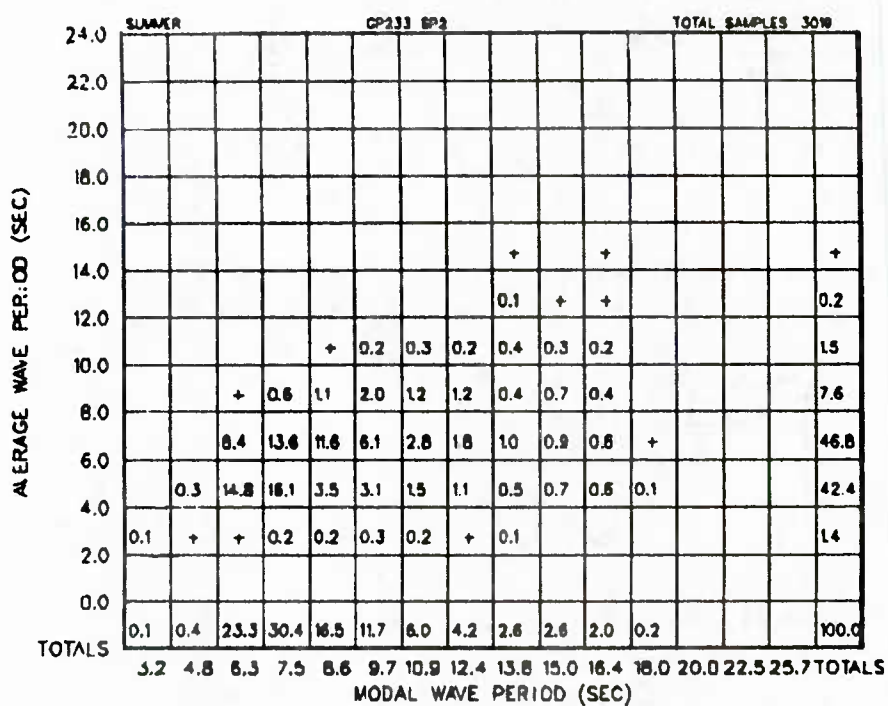


Figure A-233-4-9 Average Wave Period vs.
Modal Wave Period

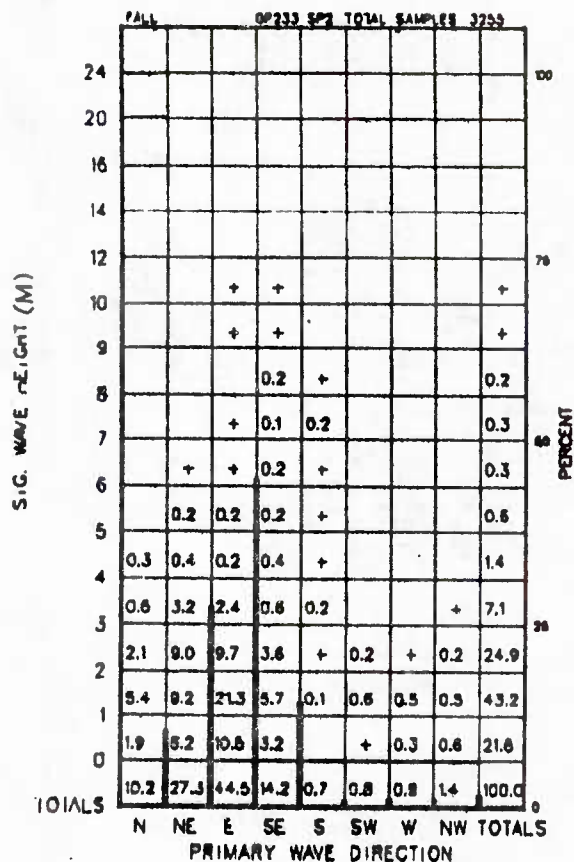


Figure A-233-5-3 Significant Wave Height vs. Primary Wave Direction

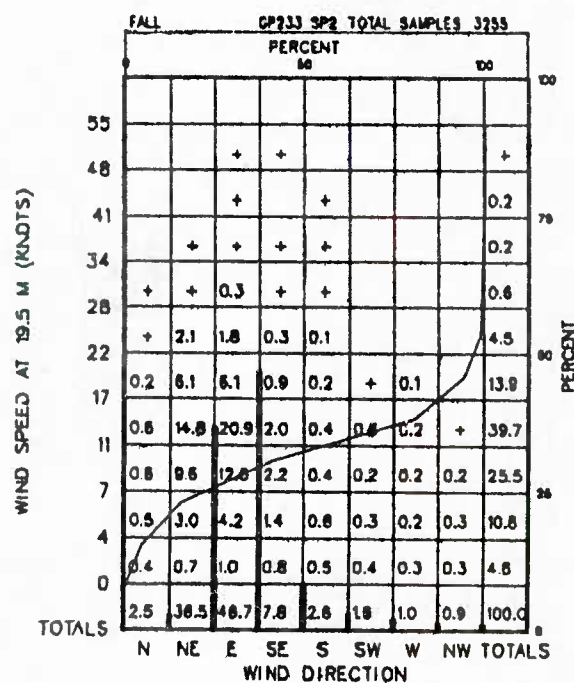


Figure A-233-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

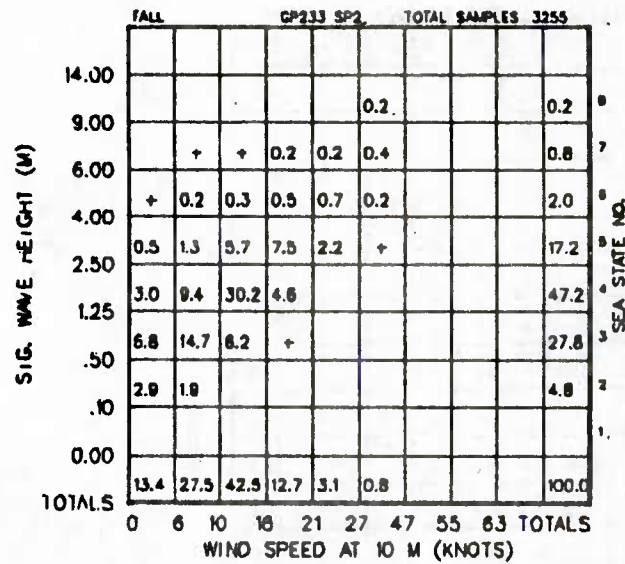


Figure A-233-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

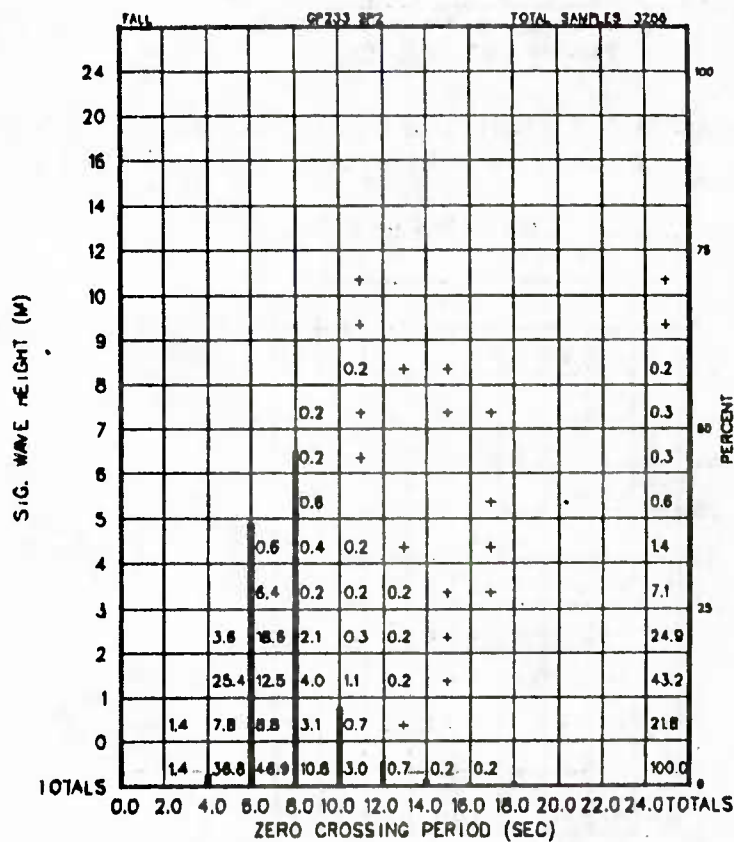


Figure A-233-5-6 Significant Wave Height vs. Zero Crossing Period

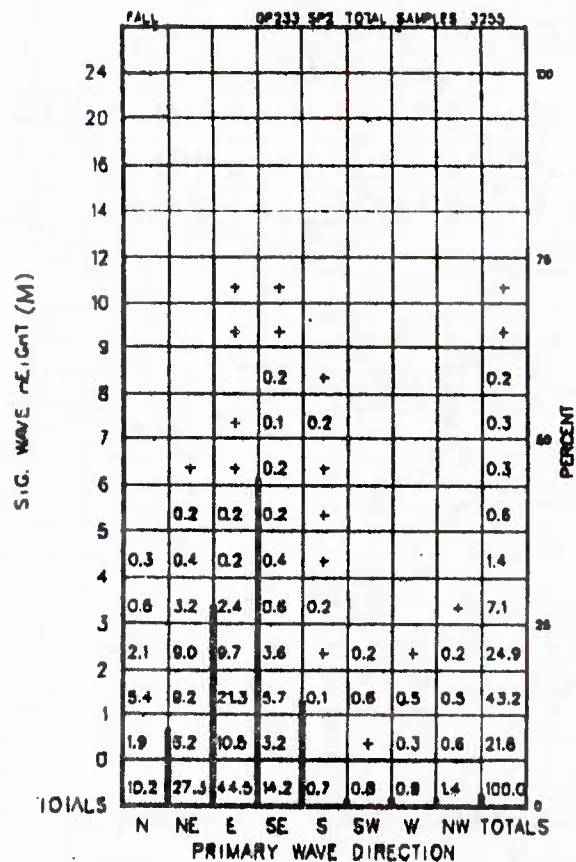


Figure A-233-5-3 Significant Wave Height vs. Primary Wave Direction

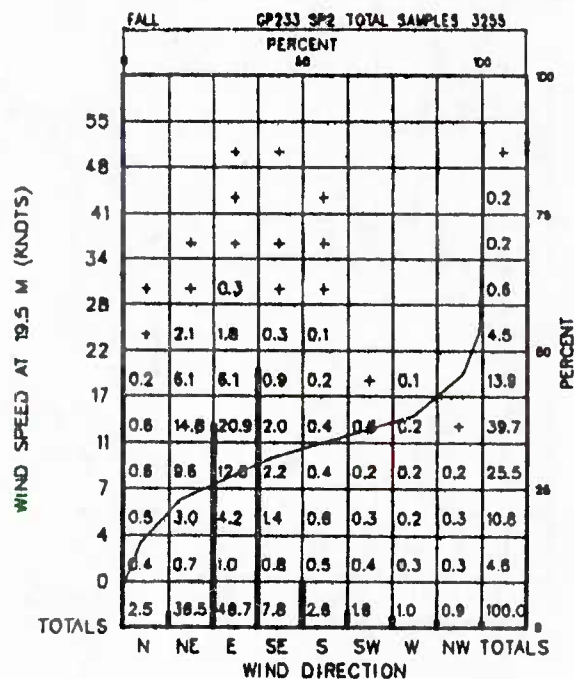


Figure A-233-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

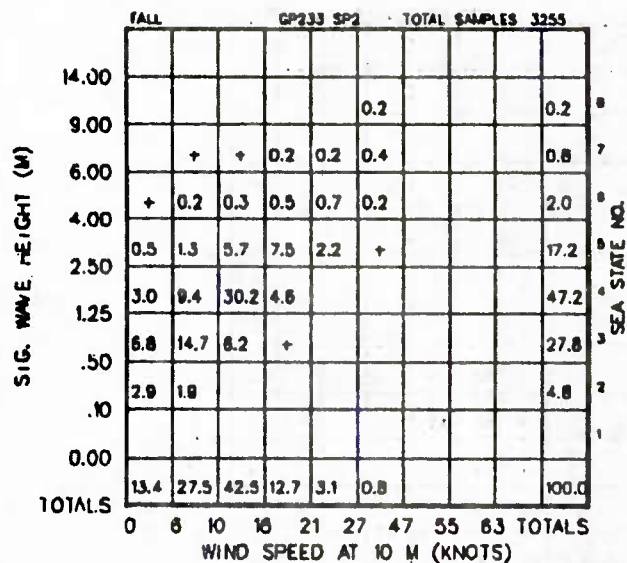


Figure A-233-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

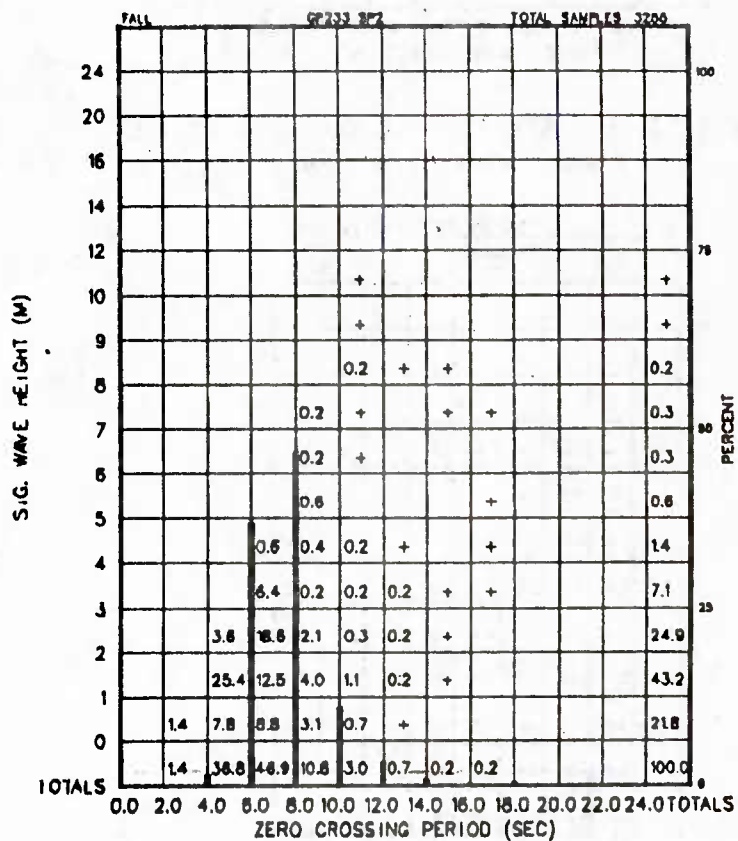


Figure A-233-5-6 Significant Wave Height vs. Zero Crossing Period

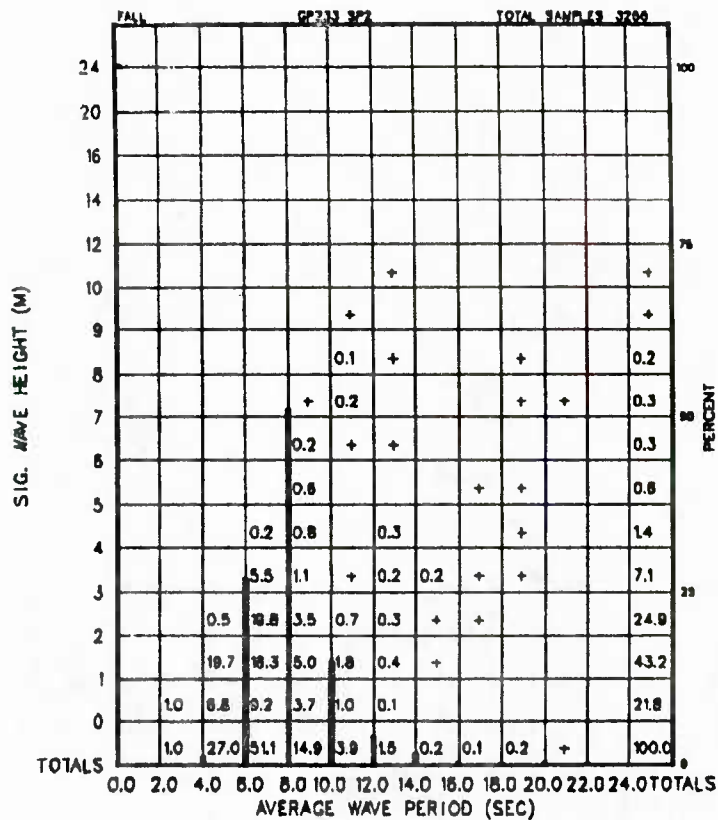


Figure A-233-5-7 Significant Wave Height vs. Average Wave Period

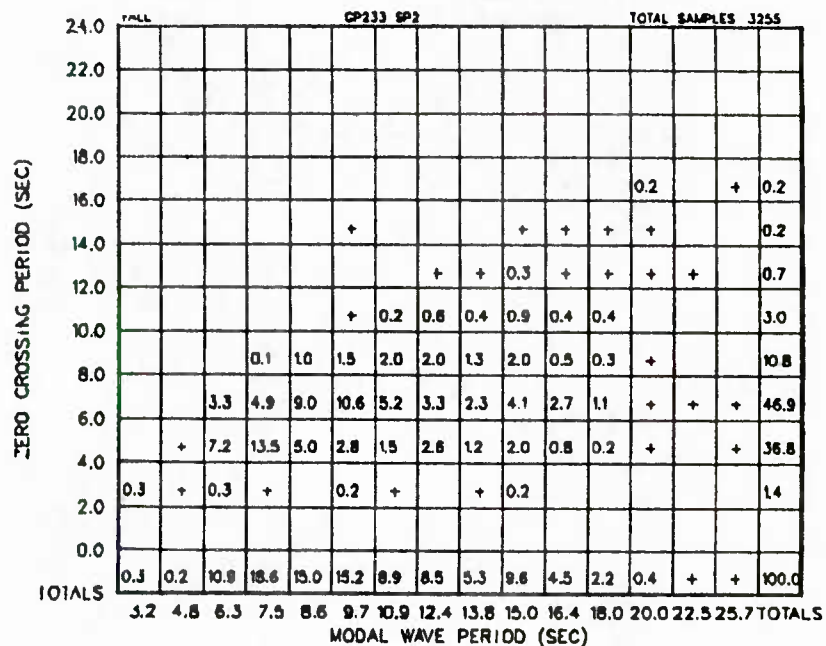


Figure A-233-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-028-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 51.35°N, 162.52°E						
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable	
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6 -	3 11 -	8 17 -	3.5 12.5 -	1.5 12.4 NE	
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 1 -	16 2.75 -	39 7 -	18 3.5 -	14 2.5 W-NW	
Visibility, nautical miles	6.25	12	25	-	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0 0	6 4.5	8 7.5	- -	- -	- -
Precipitation (Occurrence)	All precipitation - 16% of the time		Snow - 15% of the time (Dec-Mar)			
Relative Humidity, %	70	90	99	-	-	-
Air Temperature, °C	0	3	9	4	-	-
Sea Surface Temperature, °C	1	4	7	-	-	-
Sea Level Pressure, millibars	986	1005	1020	-	-	-
Ice	Moderate superstructure icing - 2% of the time (Dec-Mar)					
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	330 - -	- - -	- 2% 2%

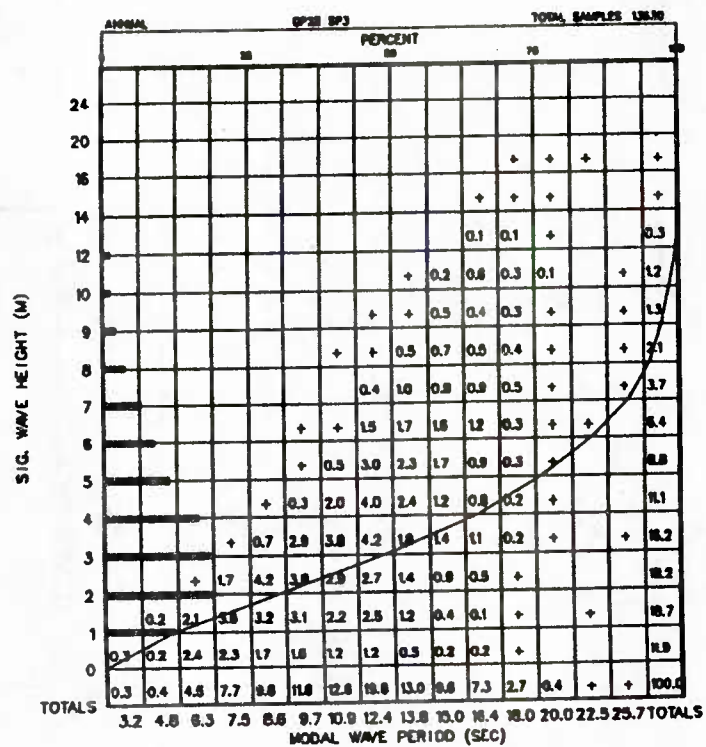


Figure A-028-1-1 Significant Wave Height vs. Modal Wave Period

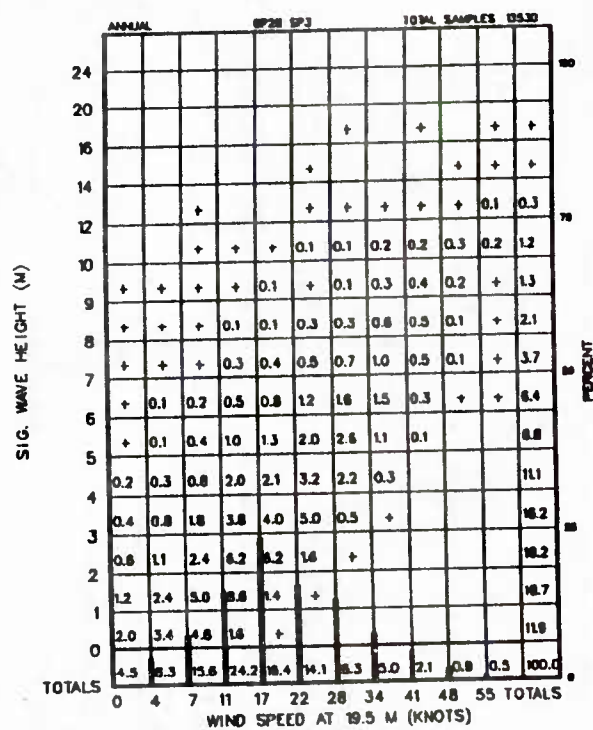


Figure A-028-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

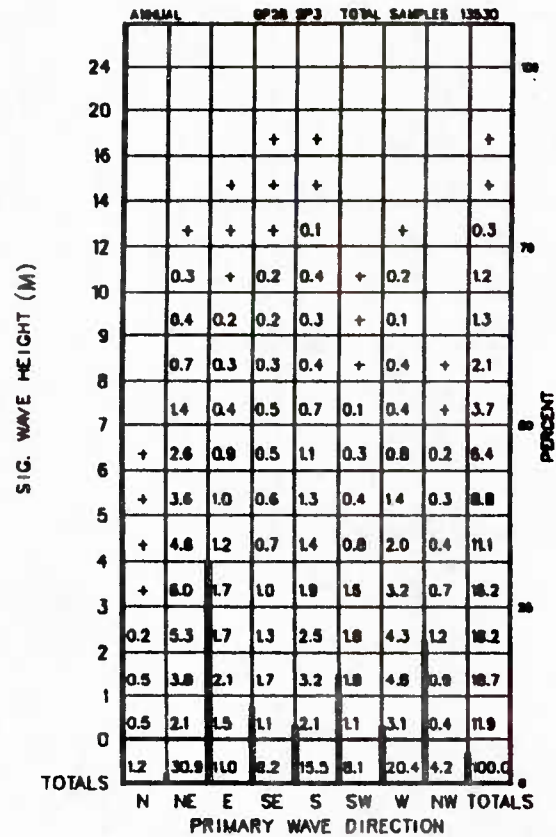


Figure A-028-1-3 Significant Wave Height vs. Primary Wave Direction

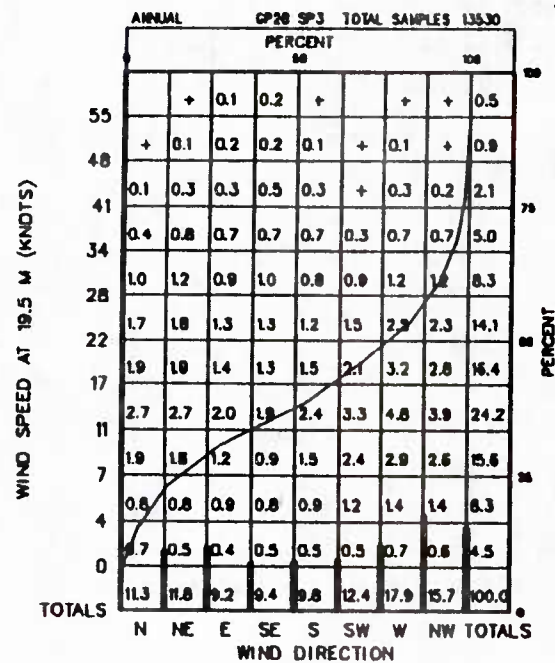


Figure A-028-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

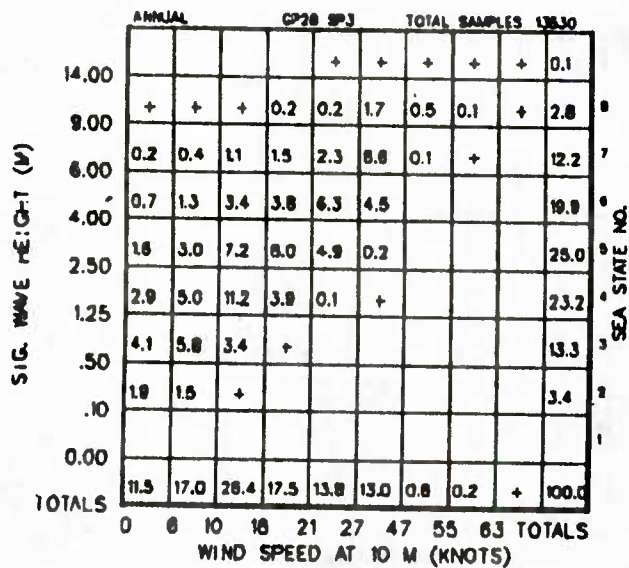


Figure A-028-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

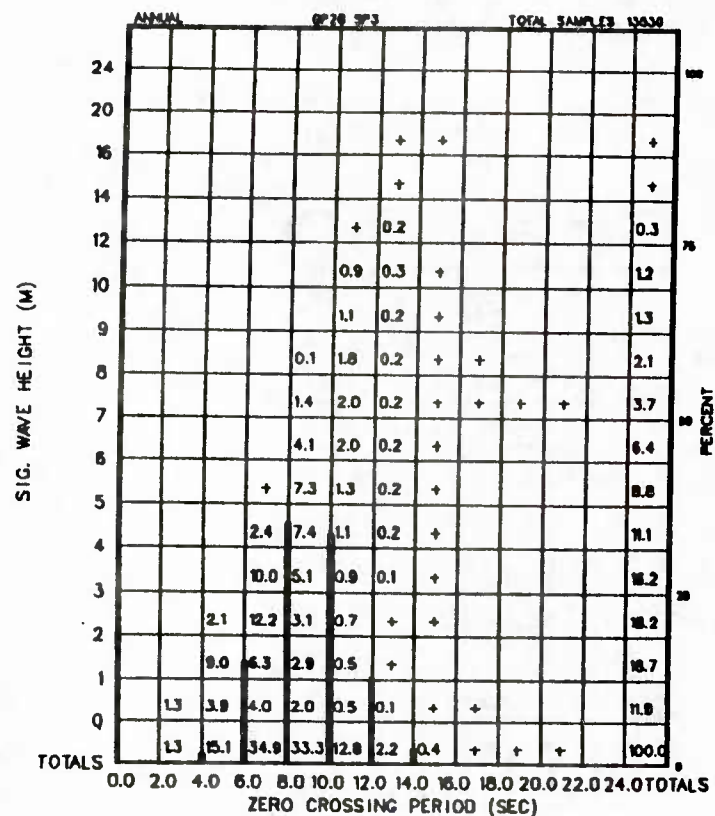
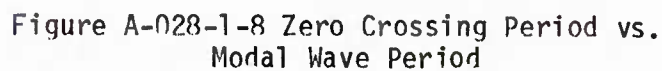
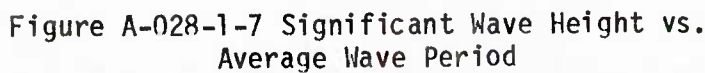


Figure A-028-1-6 Significant Wave Height vs. Zero Crossing Period



ANNUAL				GP28 SP3																TOTAL SAMPLES 15530																
WIND SPEED AT 19.5 M (KNOTS)	66	55	48	41	34	28	22	17	11	7	4	0	TOTALS	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT
	18	15	5	1									39																							
	57	13	7	2		1							80																							
	123	41	12	6	2								186																							
	278	80	32	15	10	4	2						421																							
	423	156	56	23	12	5	2		1			1	679																							
	620	231	97	45	26	14	6	2	4	1		1	1050																							
	808	289	112	57	20	15	8	2			1		1312																							
	846	362	161	89	48	31	12	14	10		2	1	1	1																						
	667	294	80	43	24	21	9	6	2		1		1187																							
	462	141	67	19	10	7		2					708																							
	251	53	37	8	11	3	3	1	1				389																							
	4583	1575	708	311	165	101	42	27	18	1	4	3	1	1	1																					
TOTALS																	7639																	7639		

Figure A-028-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

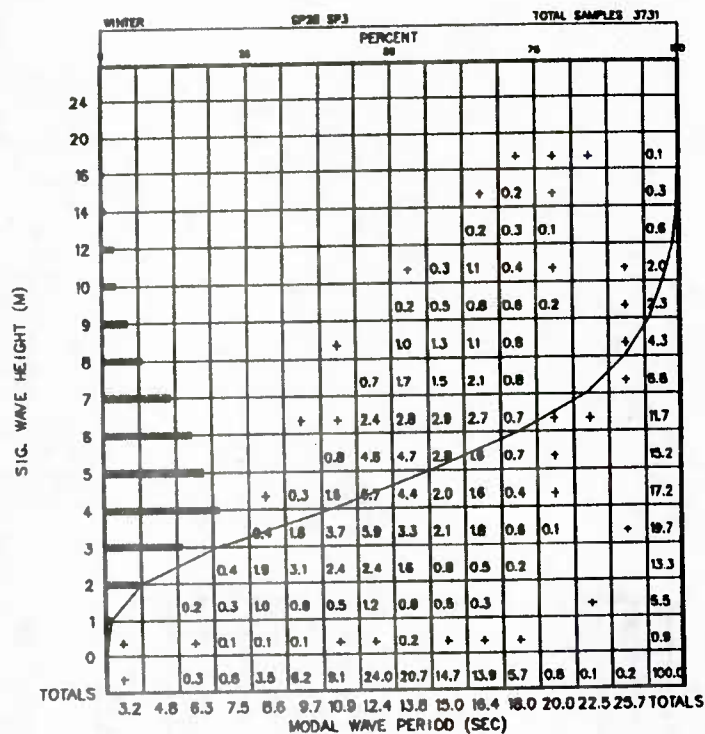


Figure A-028-2-1 Significant Wave Height vs. Modal Wave Period

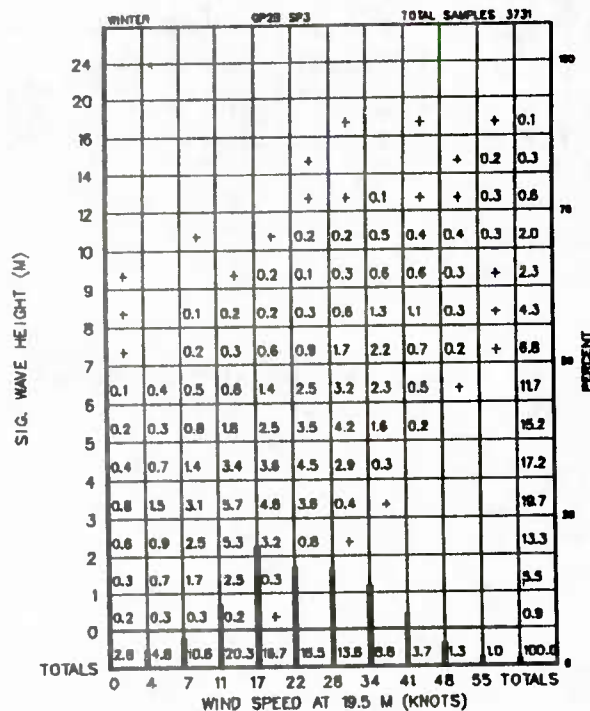


Figure A-028-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

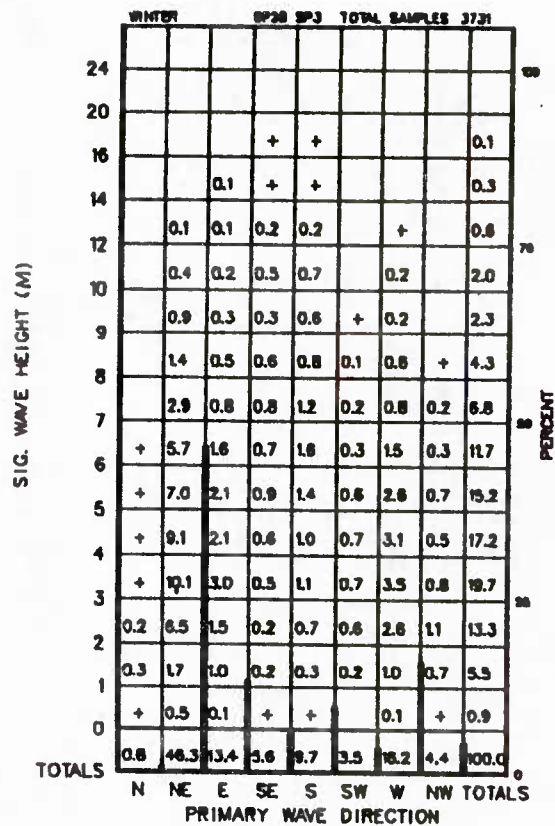


Figure A-028-2-3 Significant Wave Height vs. Primary Wave Direction

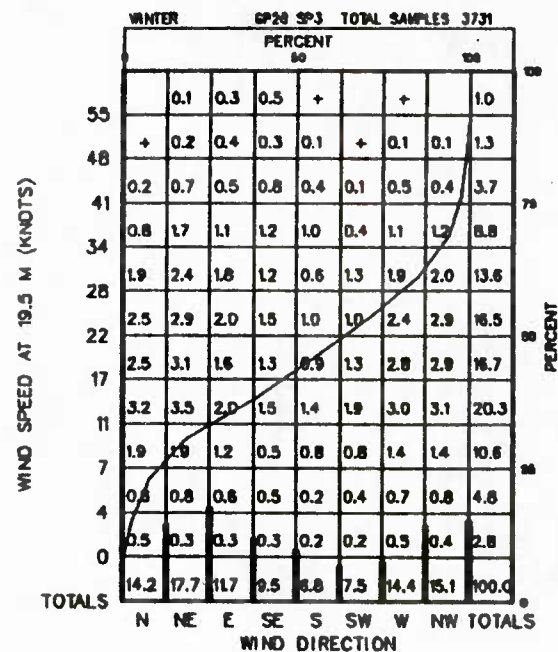


Figure A-028-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

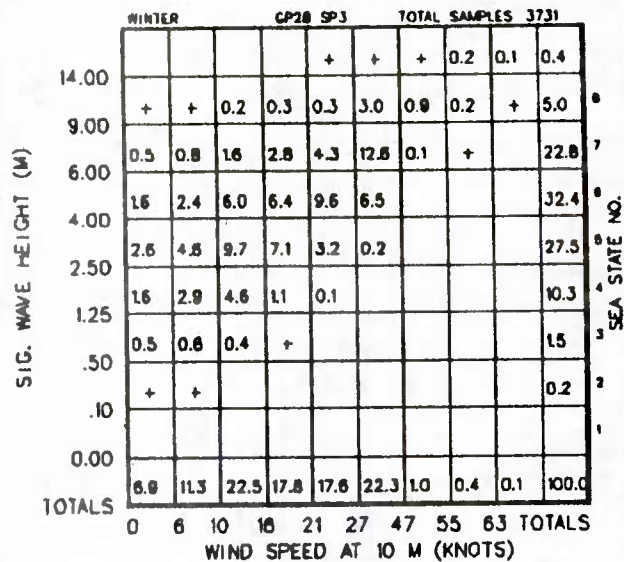


Figure A-028-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

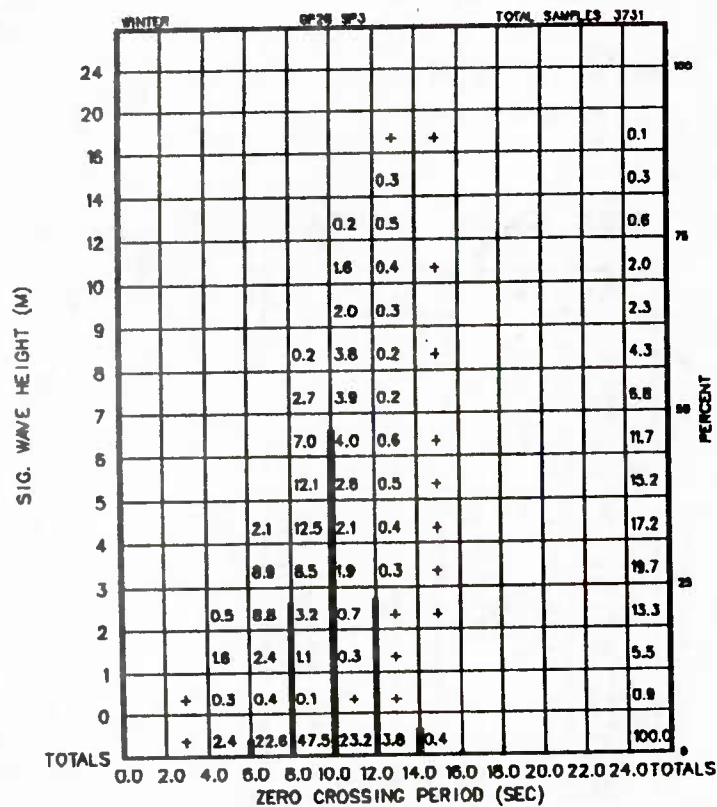


Figure A-028-2-6 Significant Wave Height vs. Zero Crossing Period

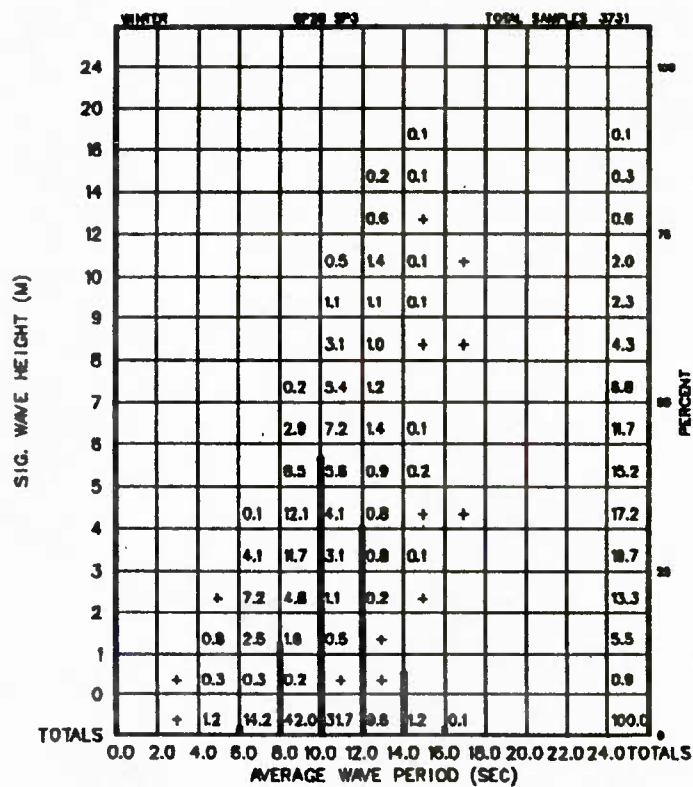


Figure A-028-2-7 Significant Wave Height vs. Average Wave Period

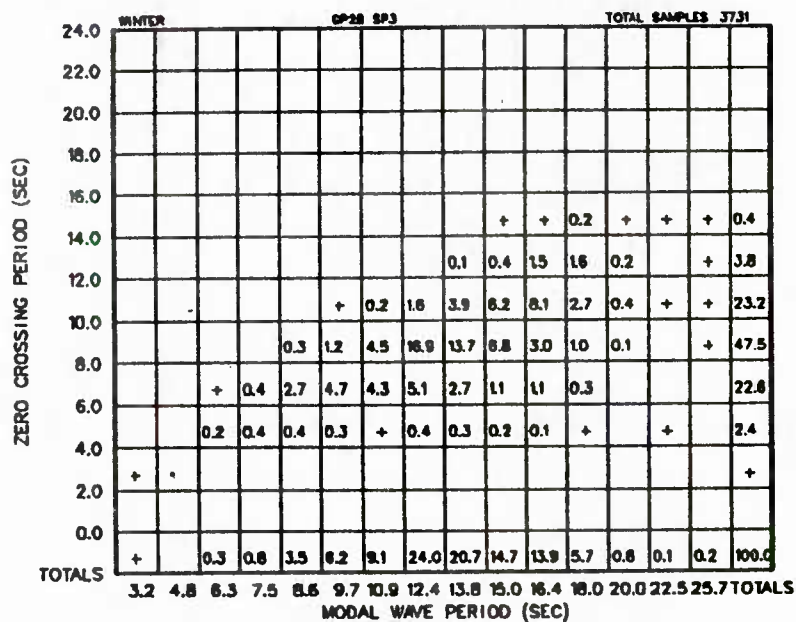


Figure A-028-2-8 Zero Crossing Period vs. Modal Wave Period

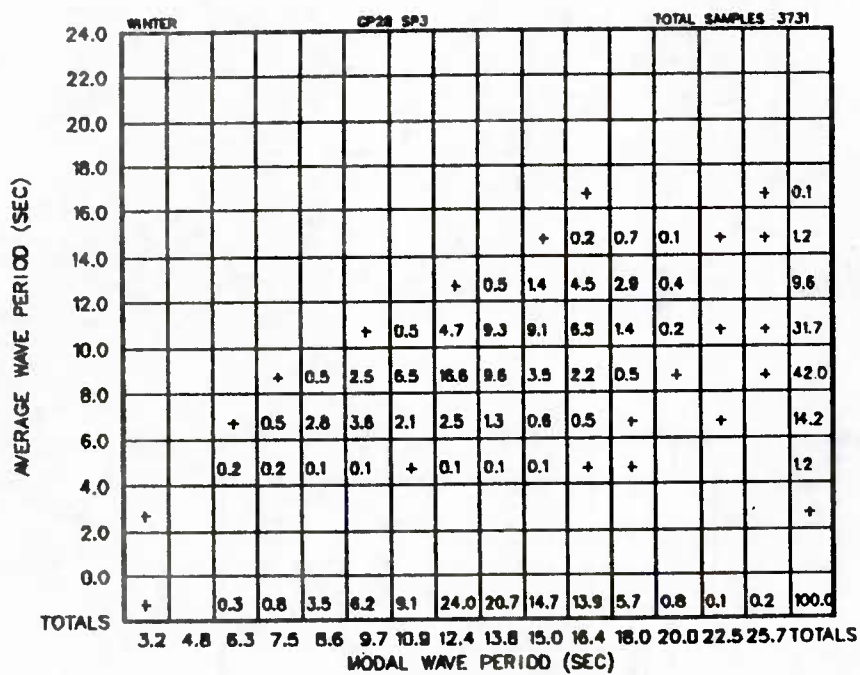


Figure A-028-2-9 Average Wave Period vs.
Modal Wave Period

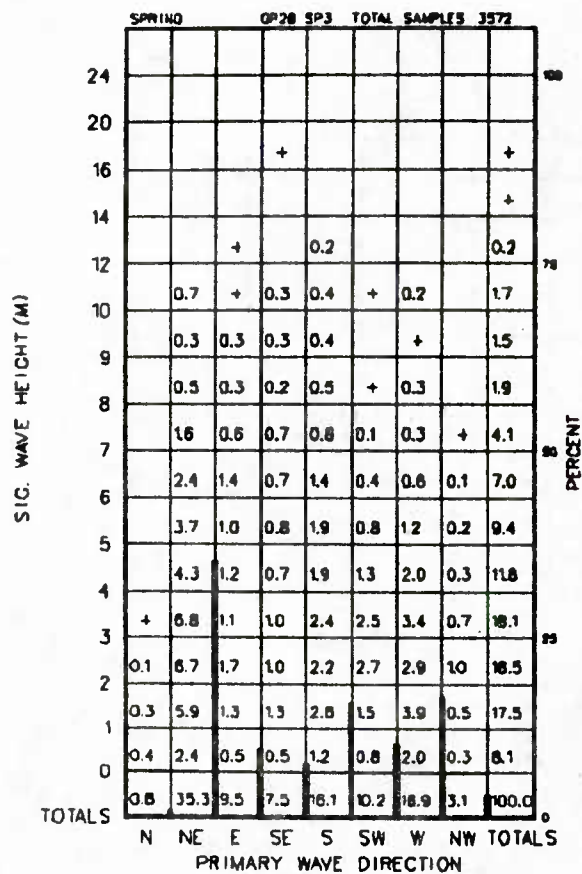


Figure A-028-3-3 Significant Wave Height vs. Primary Wave Direction

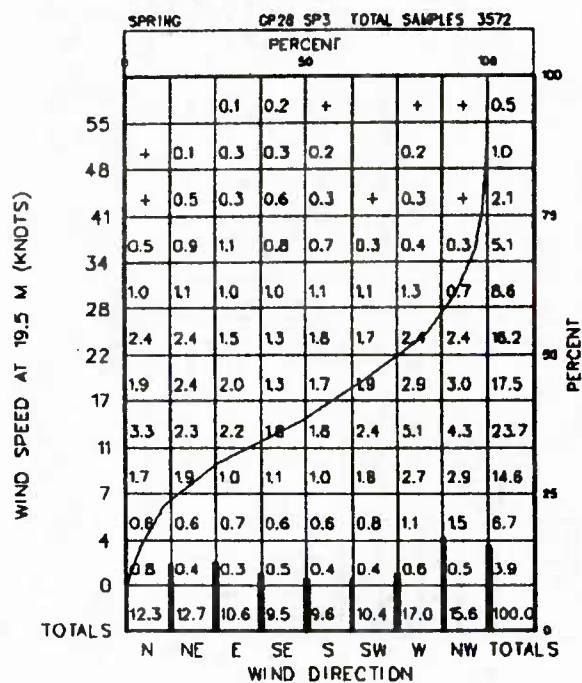


Figure A-028-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

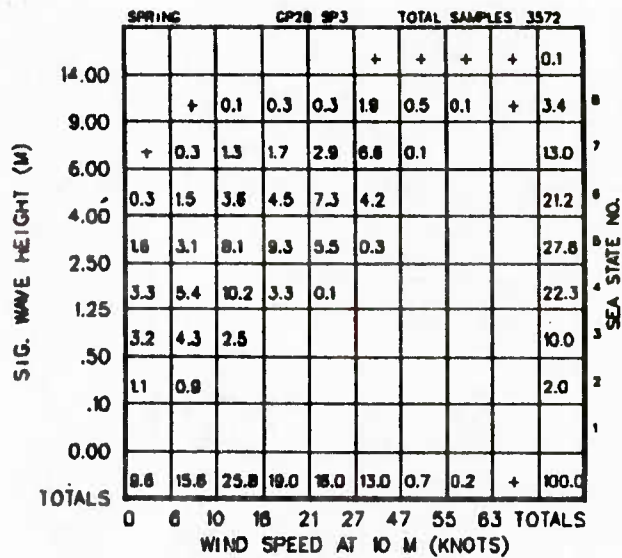


Figure A-028-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

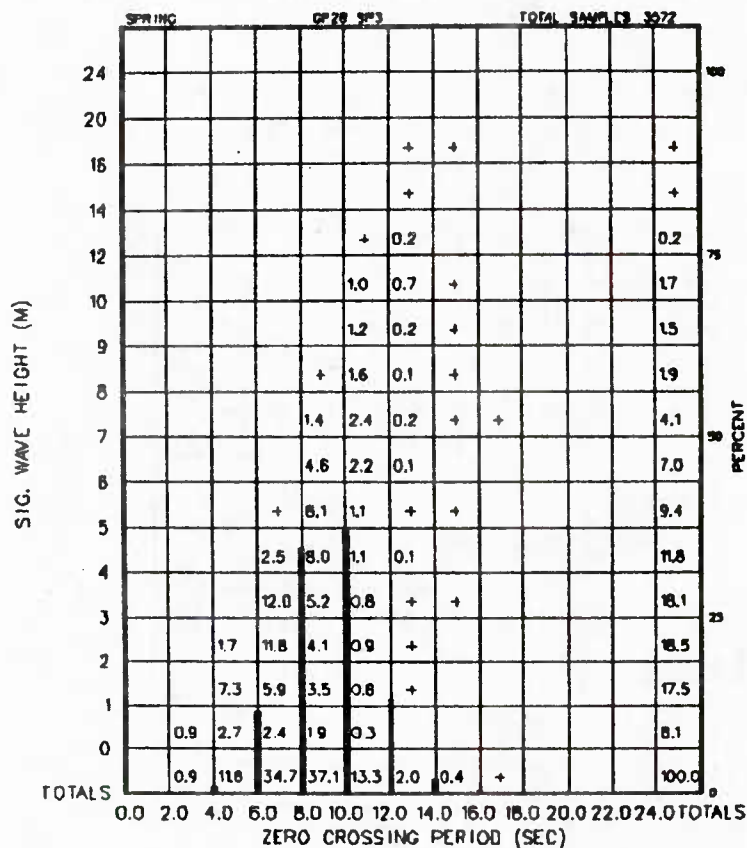
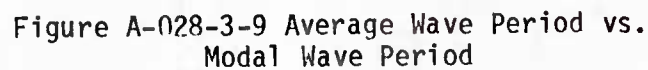


Figure A-028-3-6 Significant Wave Height vs. Zero Crossing Period



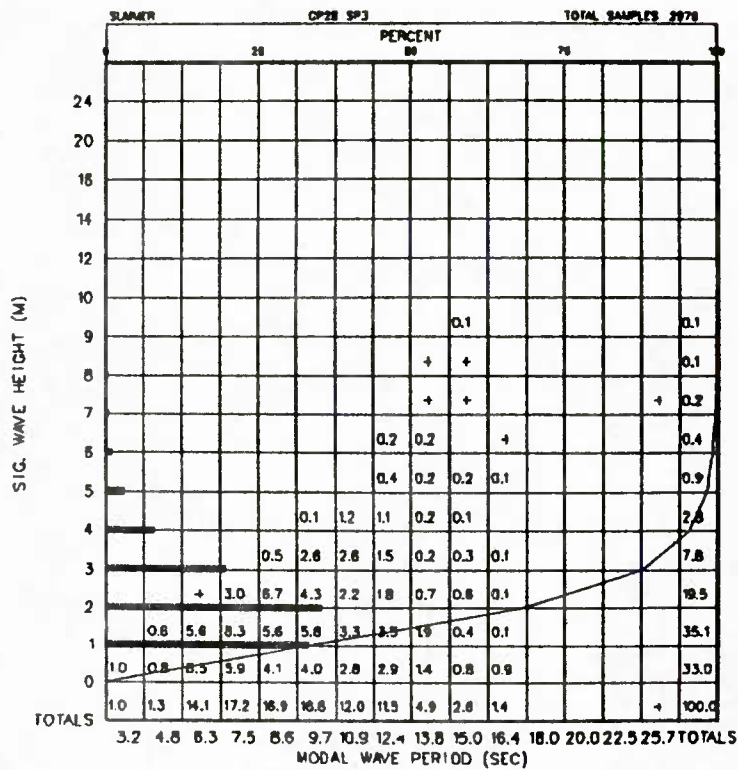
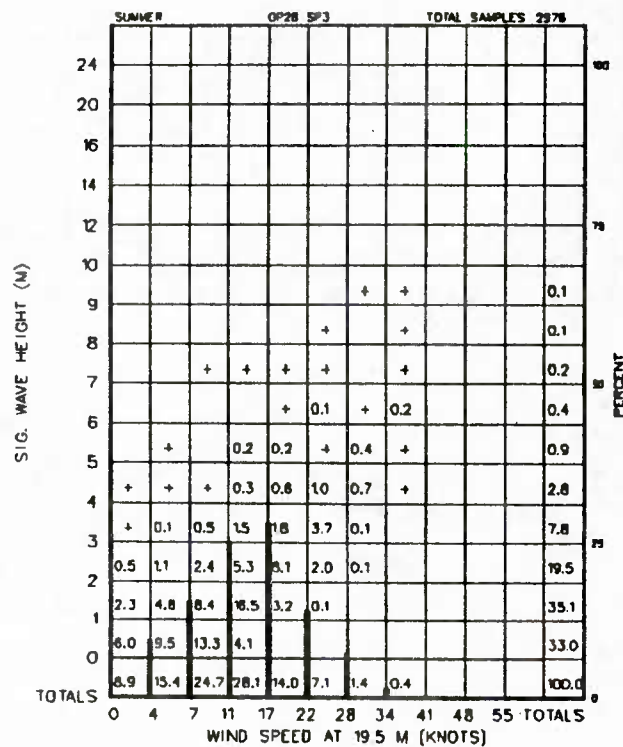


Figure A-028-4-1 Significant Wave Height vs. Modal Wave Period



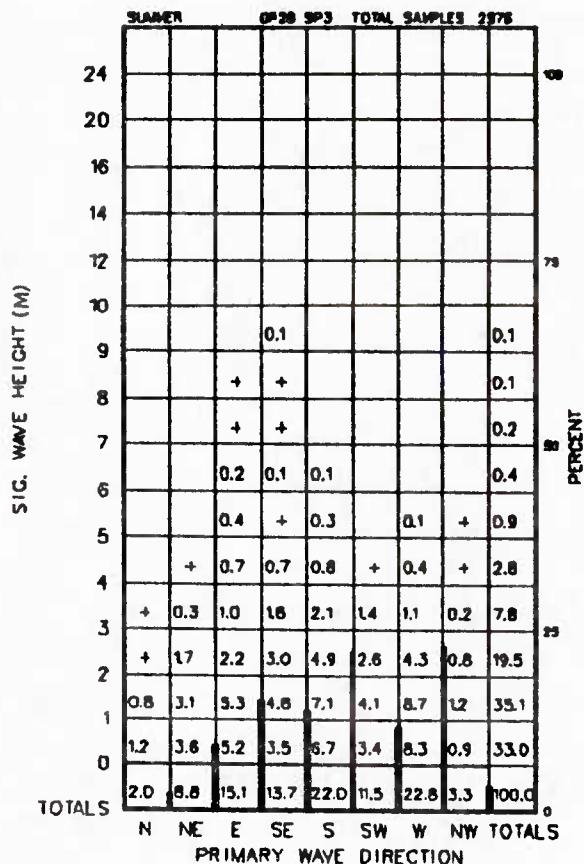


Figure A-028-4-3 Significant Wave Height vs. Primary Wave Direction

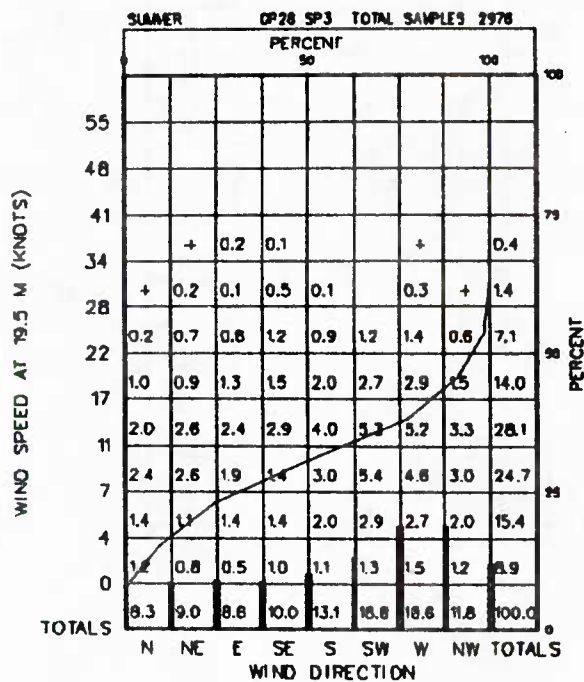


Figure A-028-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

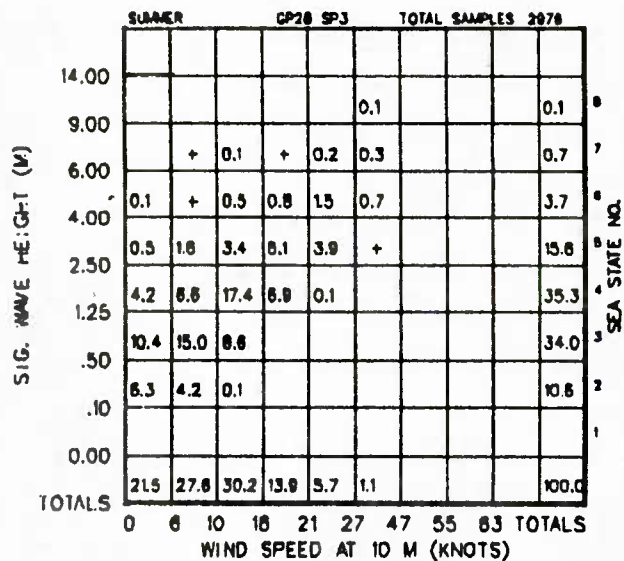


Figure A-028-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

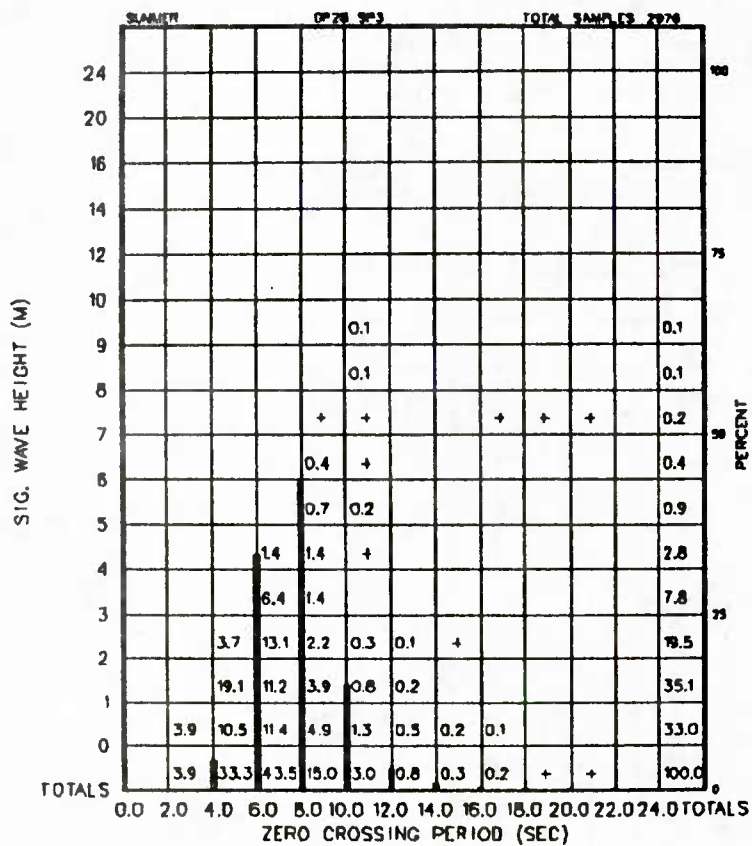


Figure A-028-4-6 Significant Wave Height vs. Zero Crossing Period

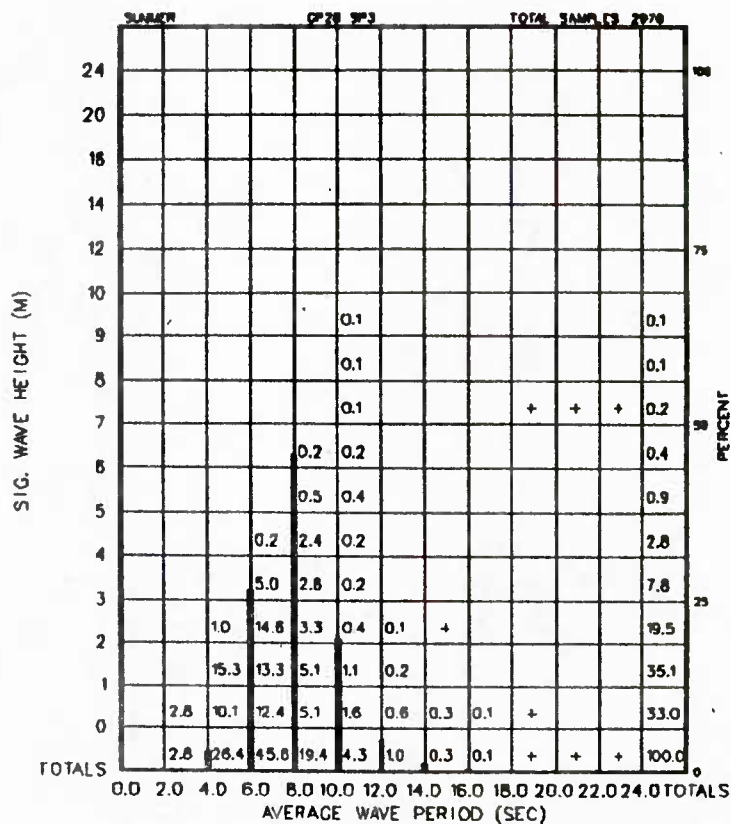


Figure A-028-4-7 Significant Wave Height vs. Average Wave Period

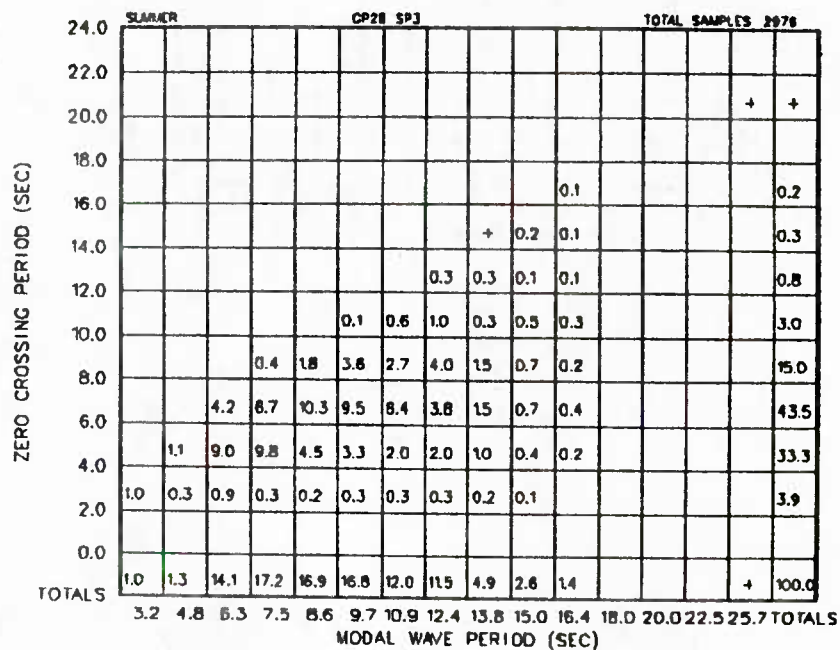


Figure A-028-4-8 Zero Crossing Period vs. Modal Wave Period

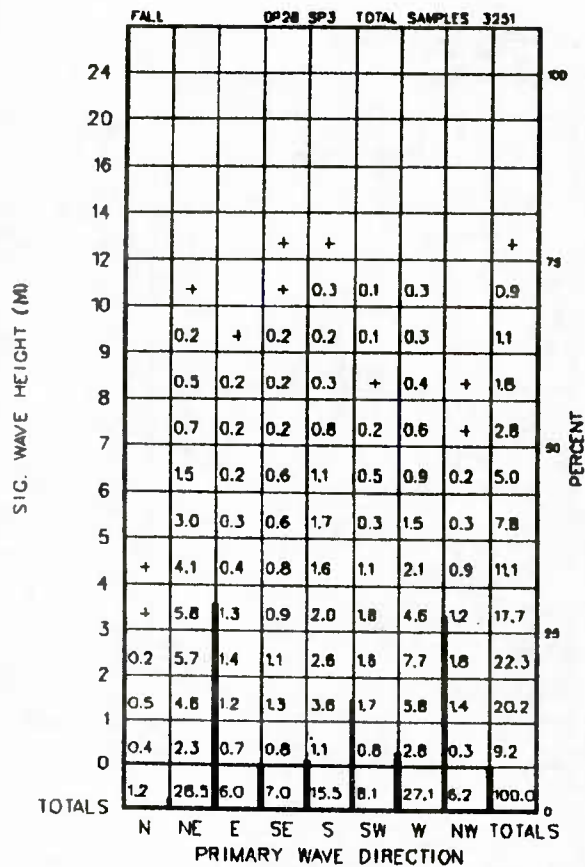


Figure A-028-5-3 Significant Wave Height vs. Primary Wave Direction

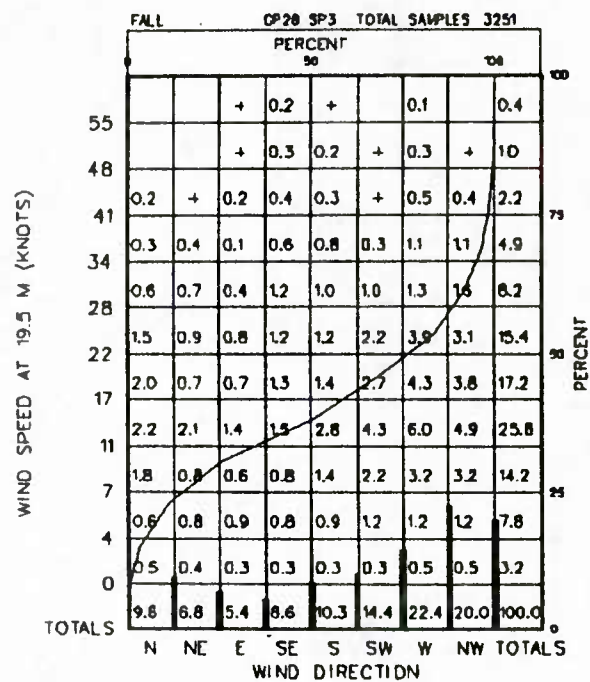


Figure A-028-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

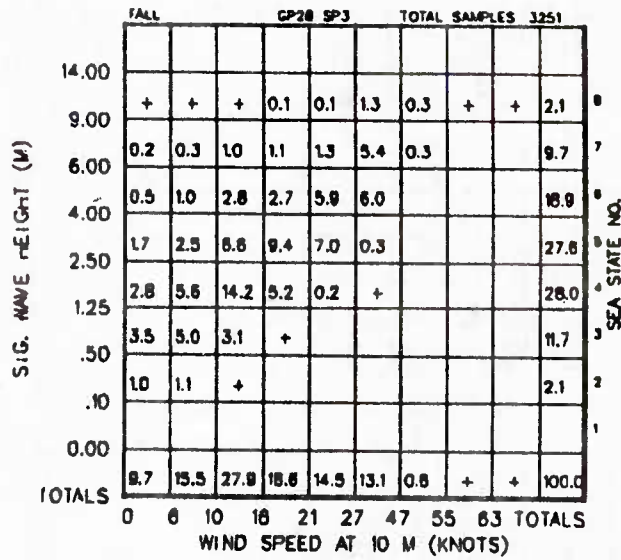


Figure A-028-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

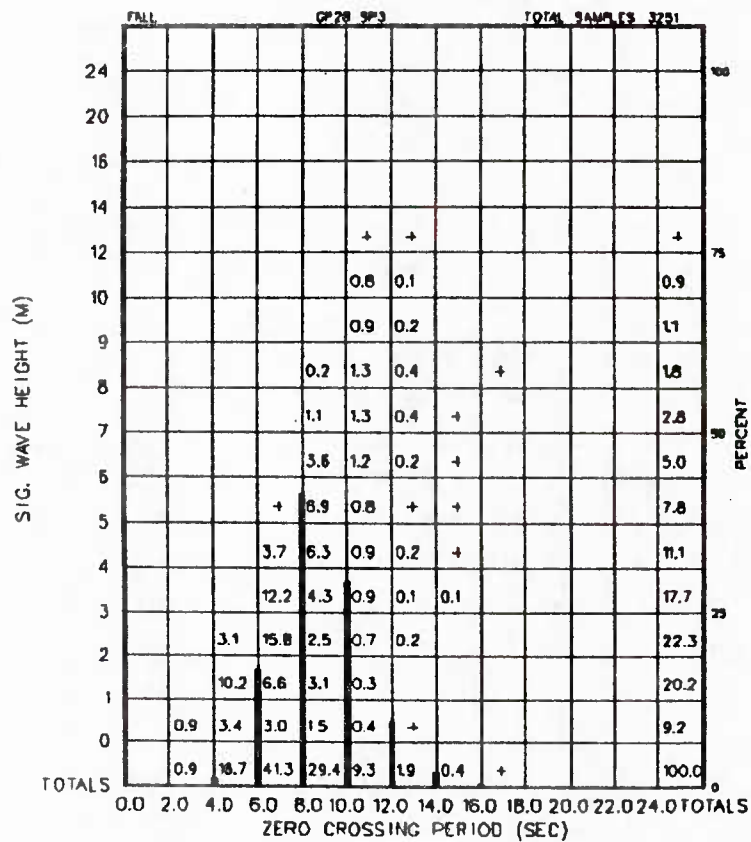


Figure A-028-5-6 Significant Wave Height vs. Zero Crossing Period

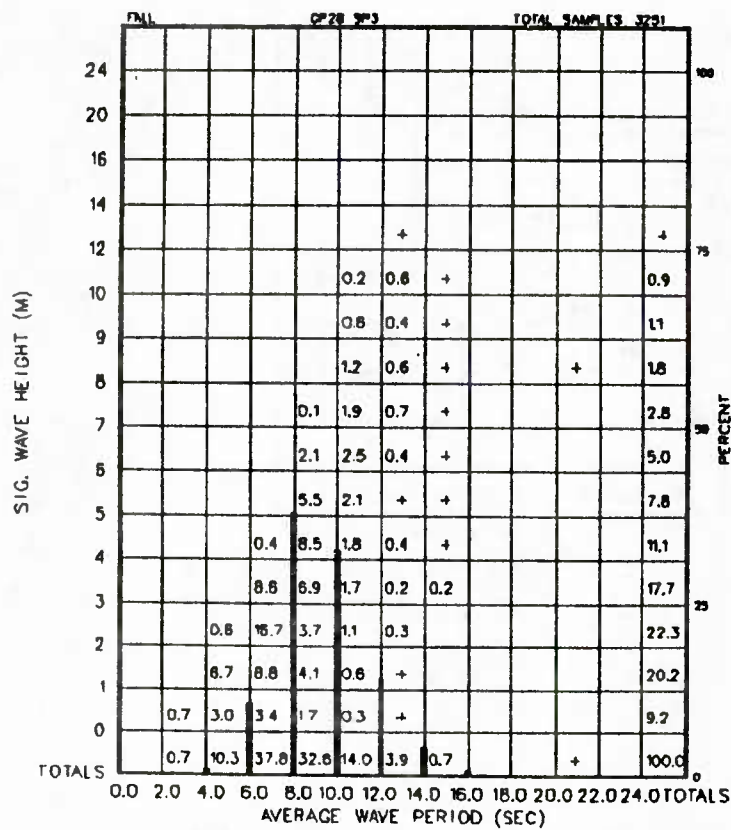


Figure A-028-5-7 Significant Wave Height vs. Average Wave Period

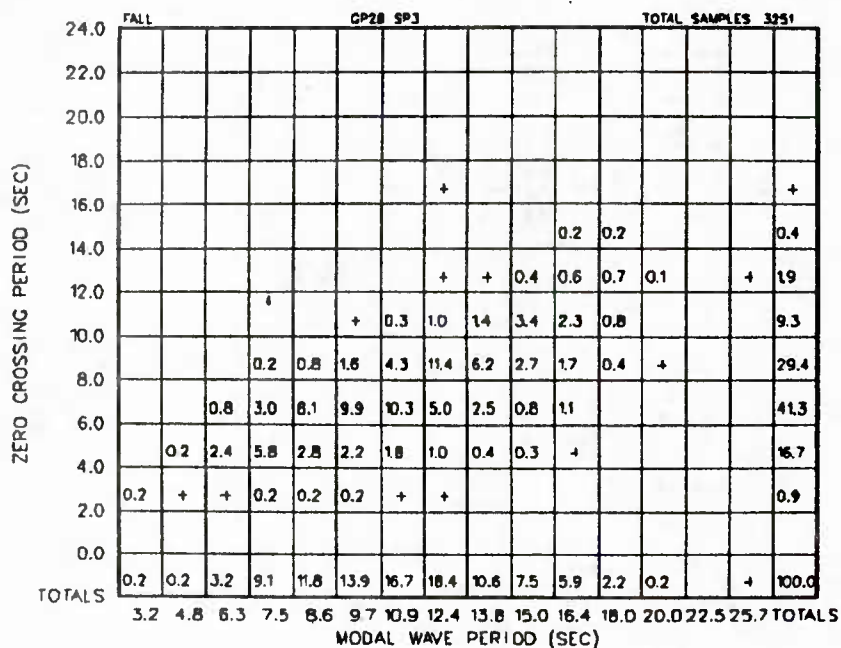


Figure A-028-5-8 Zero Crossing Period vs. Modal Wave Period

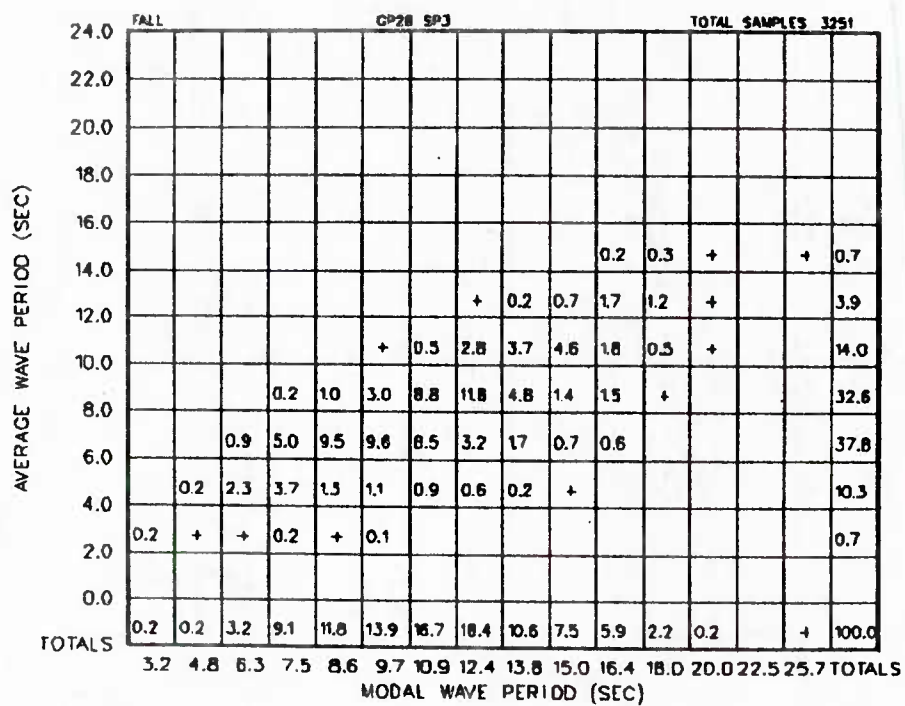


Figure A-028-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-056-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 50.04°N, 178.91°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.75 7 -	3.5 11 -	8.5 17 -	3.5 11.75 -	2.5 12.4 S-SW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1 -	17.5 3.25 -	40 7 -	19.5 3.5 -	14 2.5 W
Visibility, nautical miles	0.5	8	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 21% of the time		Snow - 12% of the time (Dec-Mar)		
Relative Humidity, %	63	86	98	-	-
Air Temperature, °C	2.5	5	9	5	-
Sea Surface Temperature, °C	3.5	6	8	-	-
Sea Level Pressure, millibars	980	1008	1030	-	-
Ice	Moderate superstructure icing - 1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	327 - -	- 3% 2%

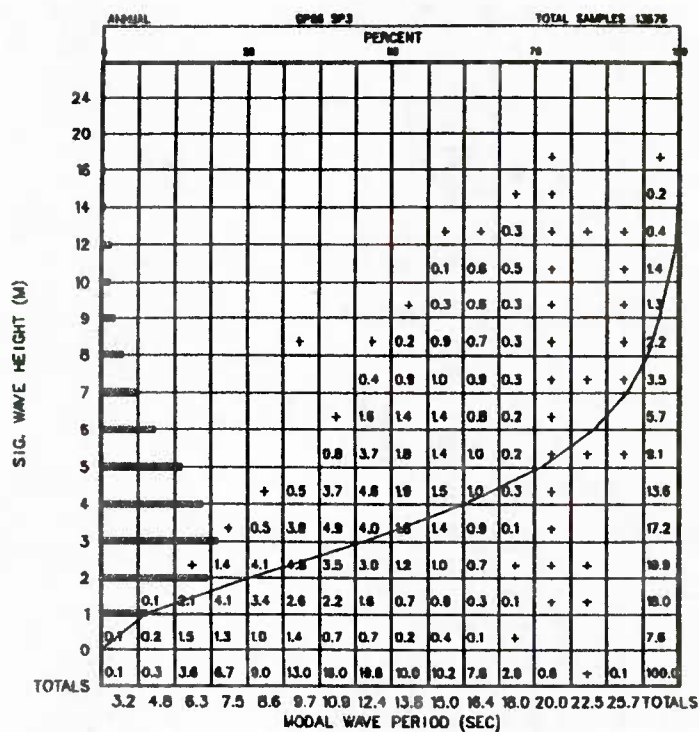
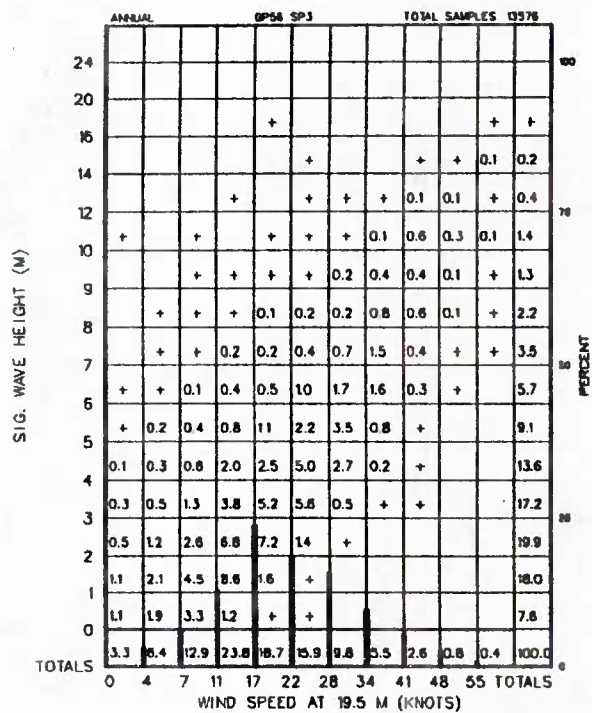


Figure A-056-1-1 Significant Wave Height vs. Modal Wave Period



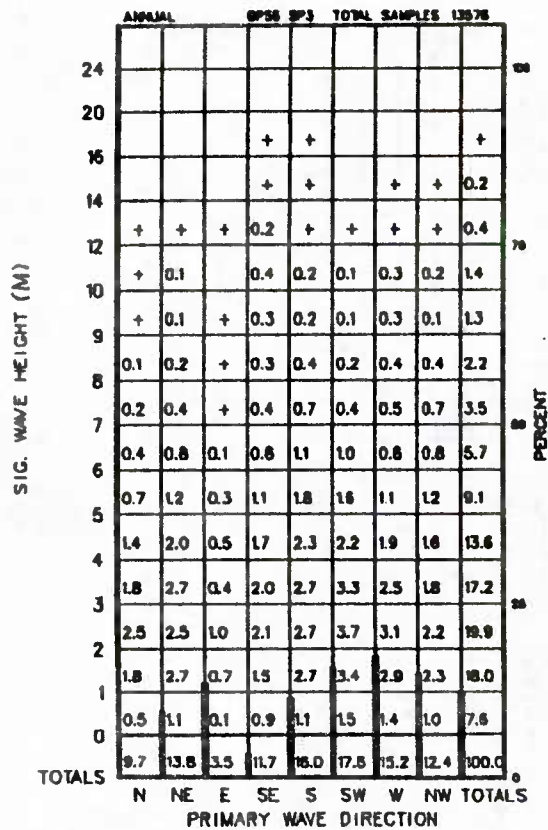


Figure A-056-1-3 Significant Wave Height vs. Primary Wave Direction

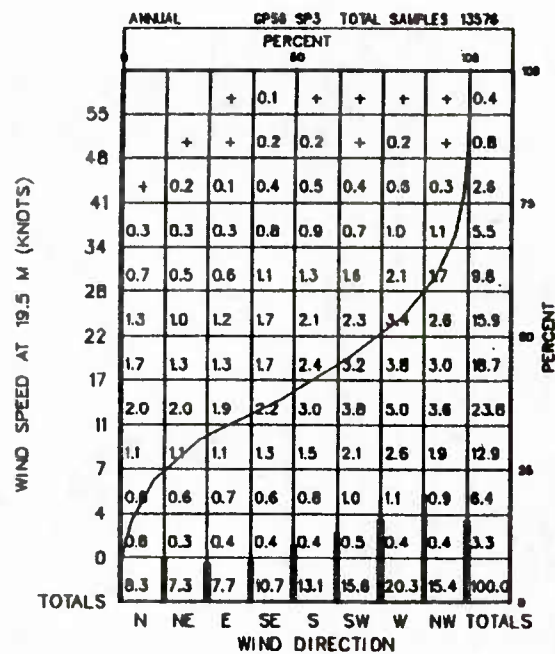


Figure A-056-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

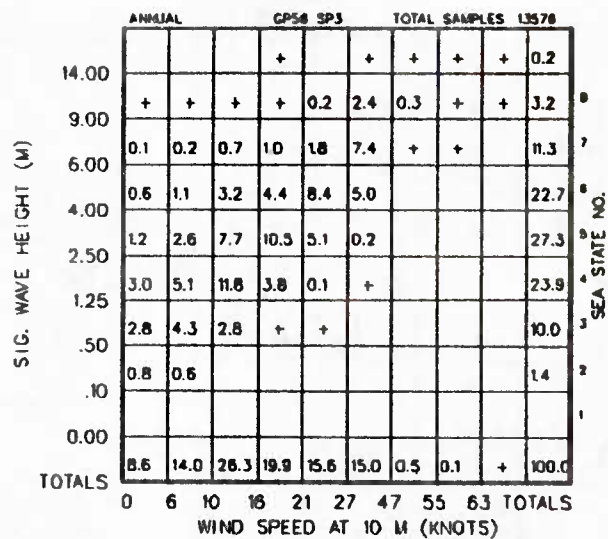


Figure A-056-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

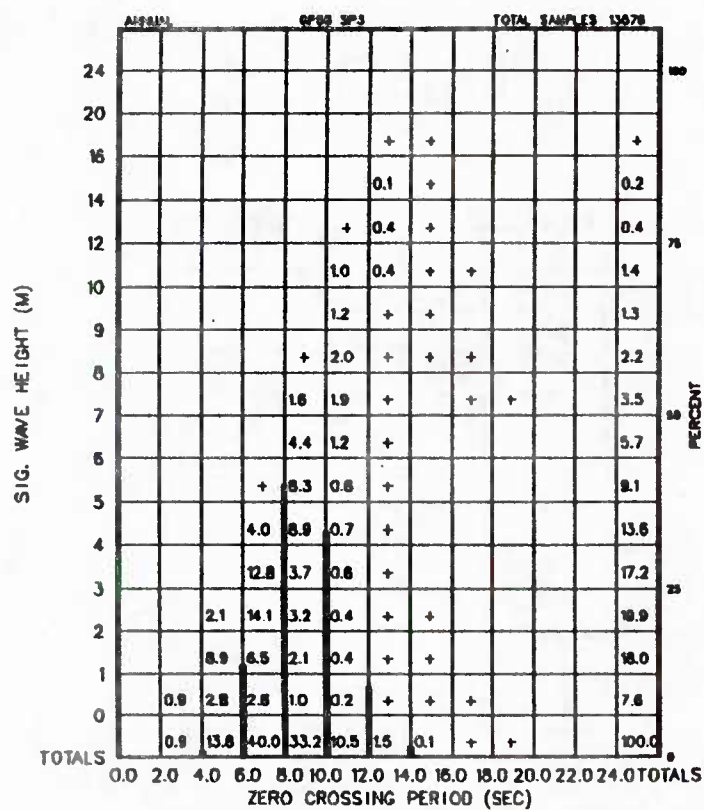


Figure A-056-1-6 Significant Wave Height vs. Zero Crossing Period

ANNUAL		DURATION (HOURS)												TOTAL SAMPLES 13578										
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT
55	15	13	3																				31	0.23
48	54	20	4	1																			79	0.58
41	145	38	21	7	4	2	1																219	1.61
34	286	110	38	12	8	2	1		1	1													459	3.38
28	490	182	79	27	17	8	1																802	5.91
22	737	287	115	51	22	14	8	3		1	1												1239	9.13
17	937	314	123	58	20	24	9	3	2		1	1											1482	10.91
11	853	375	178	82	52	28	15	12	4	3	3						1	1	1				1808	13.31
7	692	228	88	31	17	10	7	1	2														1078	7.94
4	404	115	42	19	2	2	1																585	4.31
0	202	53	21	5	2	2	3		1														289	2.13
TOTALS	4815	1738	712	293	144	88	48	19	10	5	5	1					1	1	1				7877	58.03

Figure A-056-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

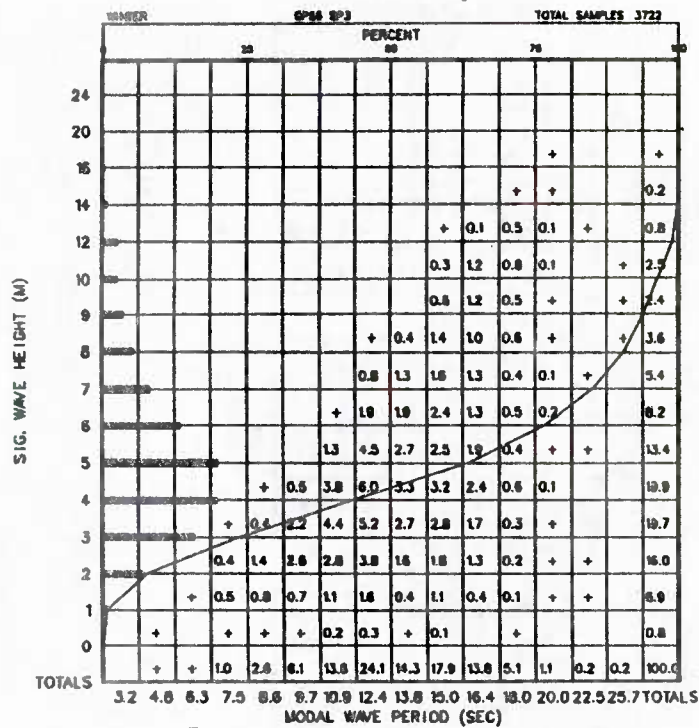


Figure A-056-2-1 Significant Wave Height vs. Modal Wave Period

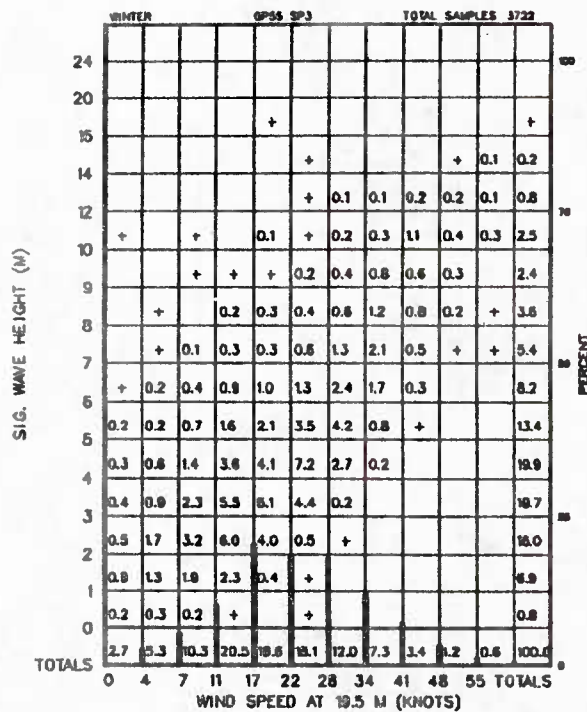


Figure A-056-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

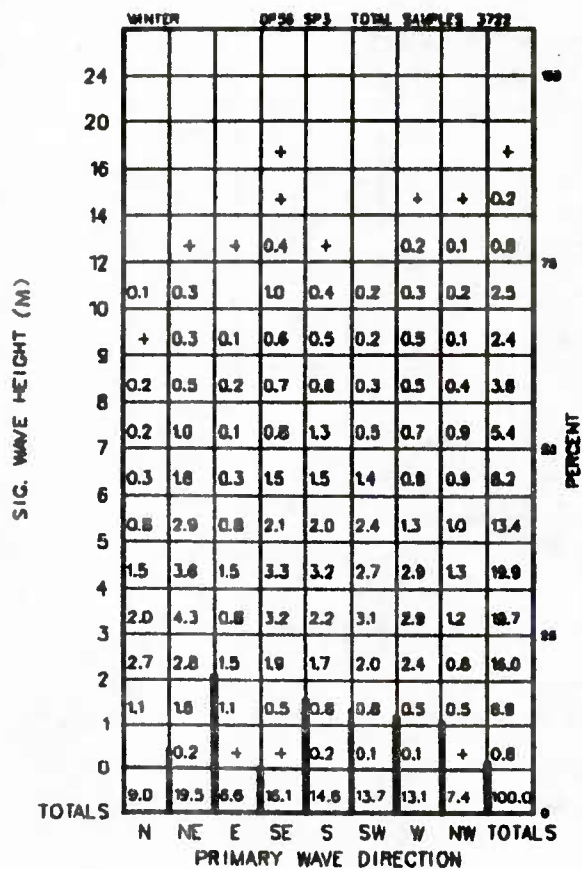


Figure A-056-2-3 Significant Wave Height vs. Primary Wave Direction

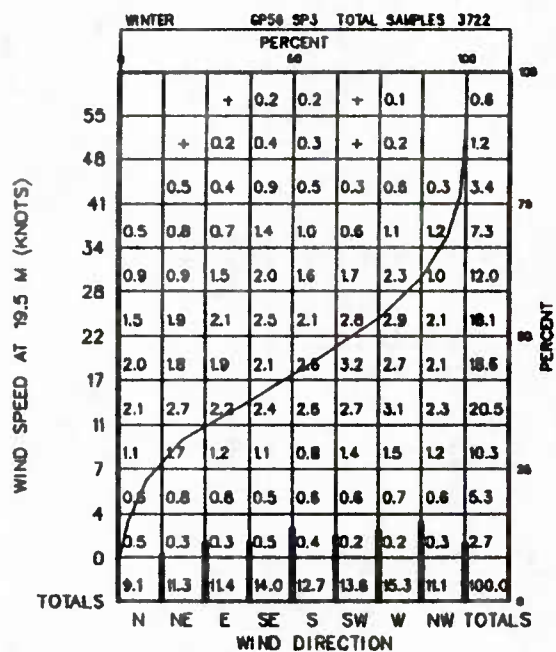


Figure A-056-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

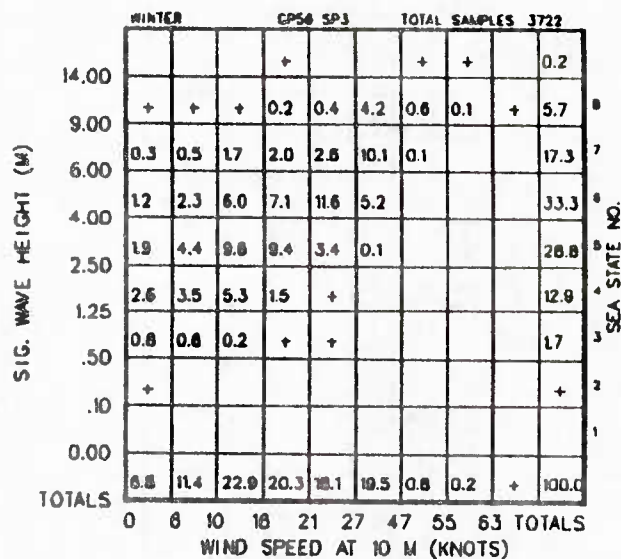


Figure A-056-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

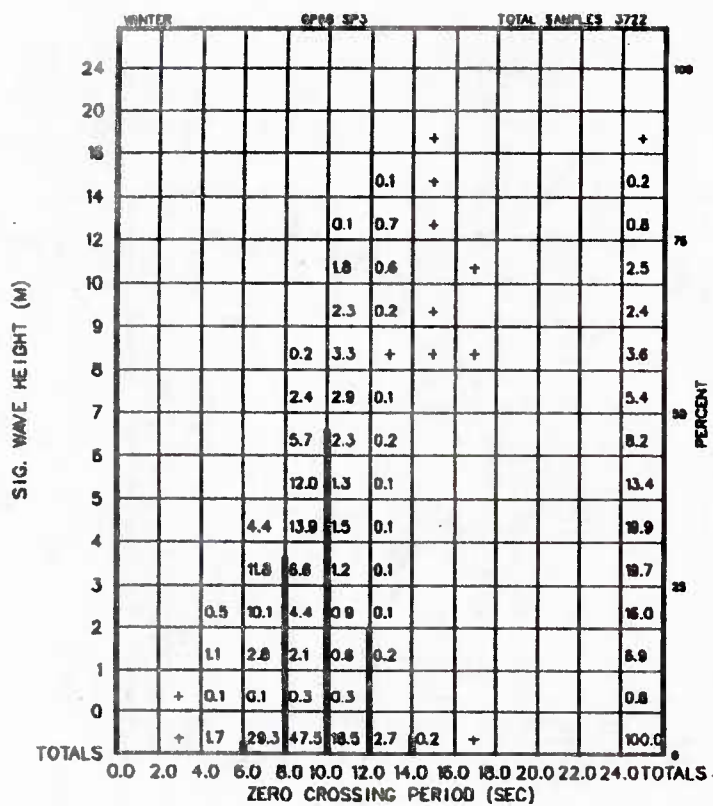


Figure A-056-2-6 Significant Wave Height vs. Zero Crossing Period

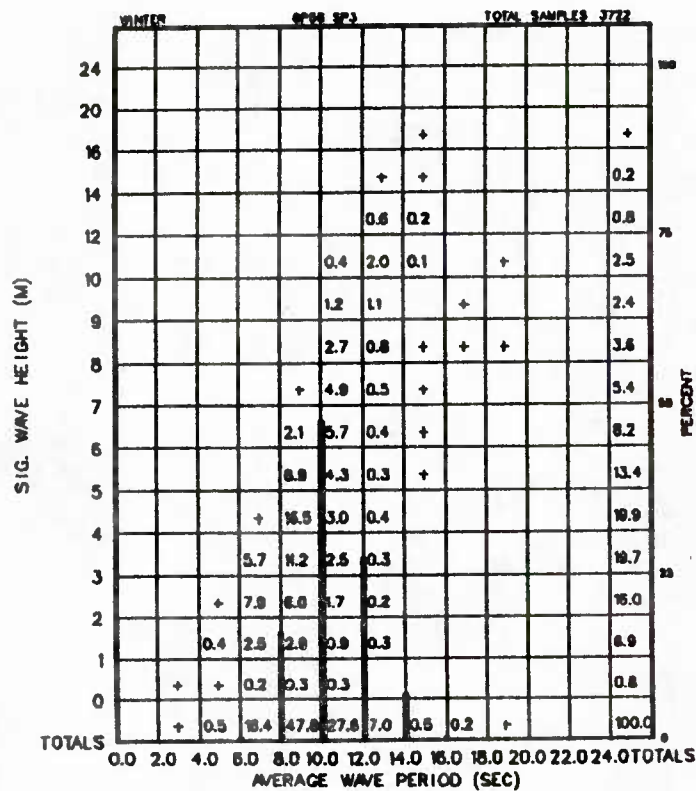


Figure A-056-2-7 Significant Wave Height vs. Average Wave Period

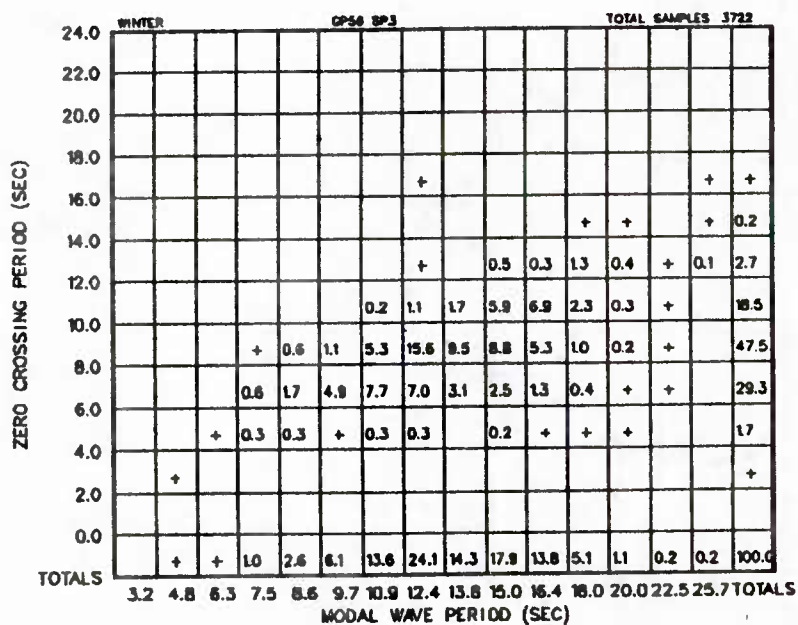


Figure A-056-2-8 Zero Crossing Period vs. Modal Wave Period

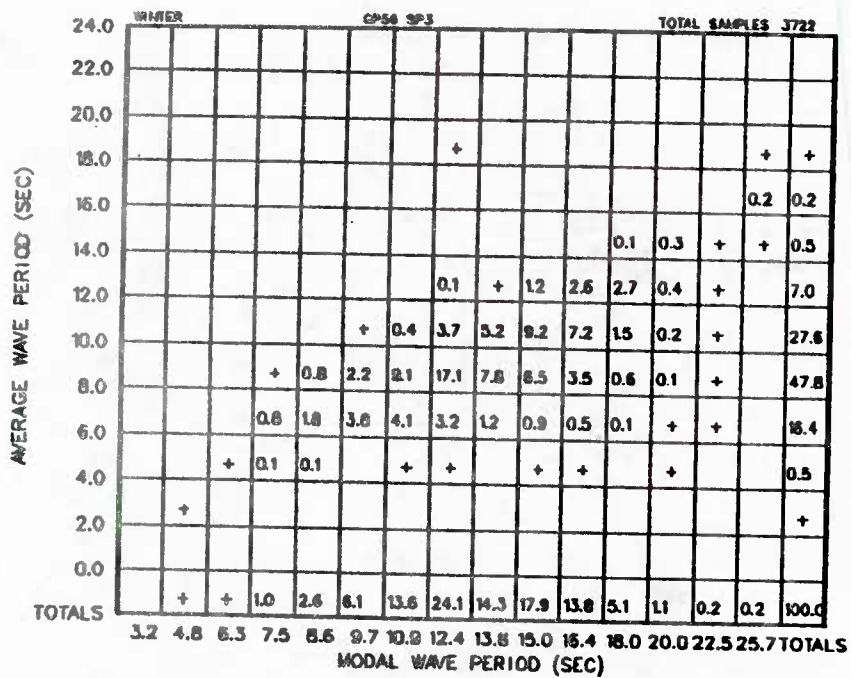


Figure A-056-2-9 Average Wave Period vs.
Modal Wave Period

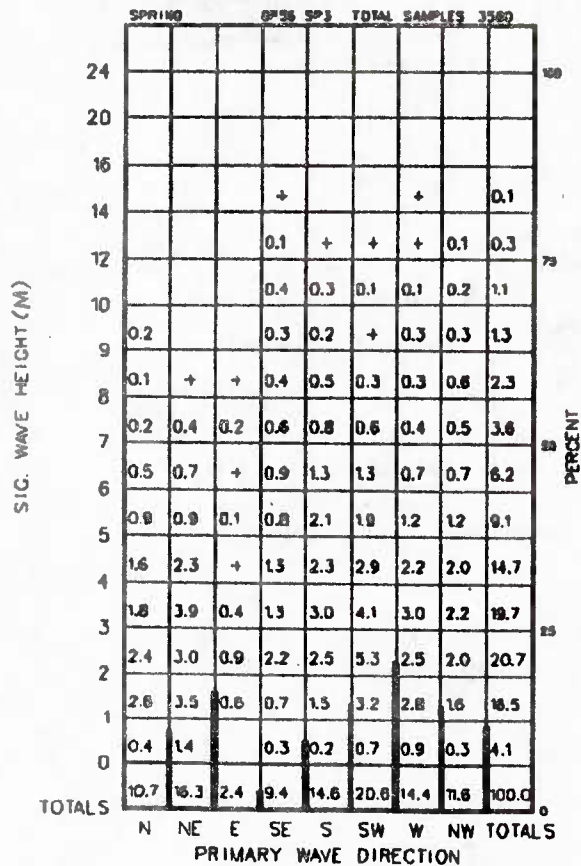


Figure A-056-3-3 Significant Wave Height vs. Primary Wave Direction

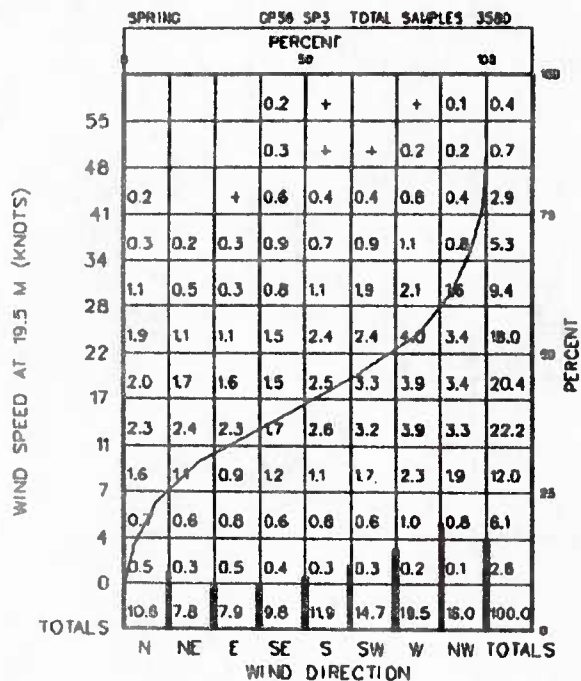


Figure A-056-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

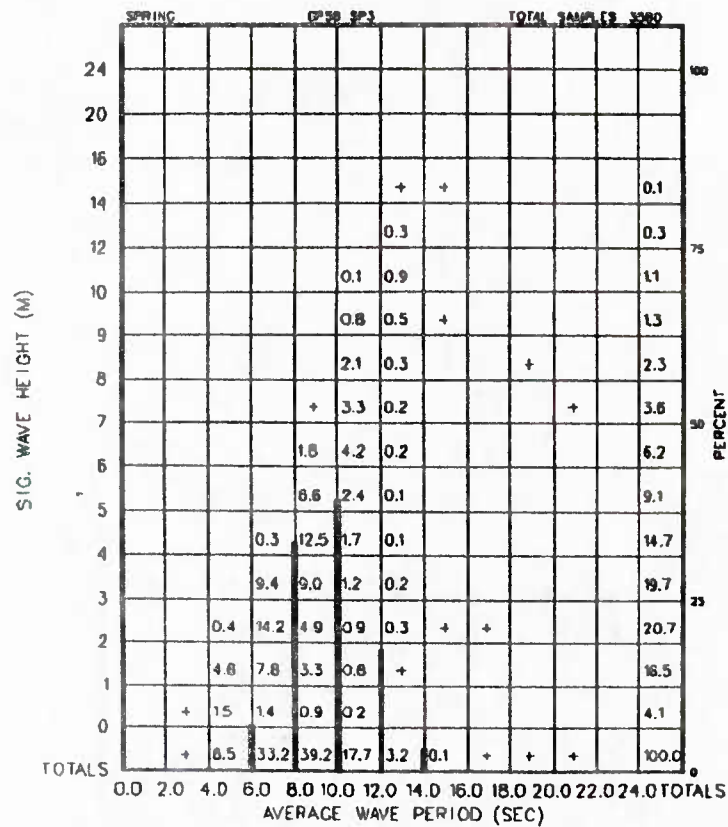


Figure A-056-3-7 Significant Wave Height vs. Average Wave Period

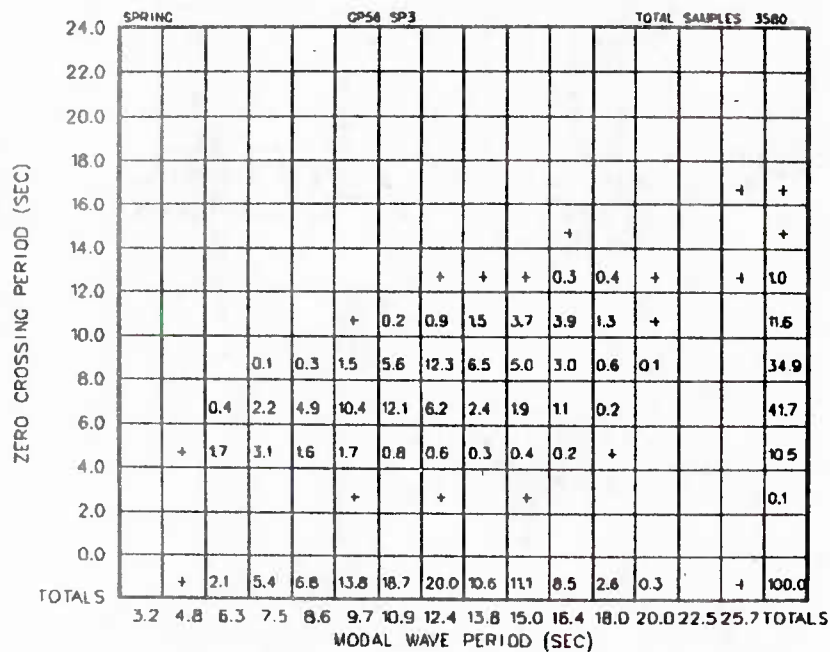


Figure A-056-3-8 Zero Crossing Period vs. Modal Wave Period

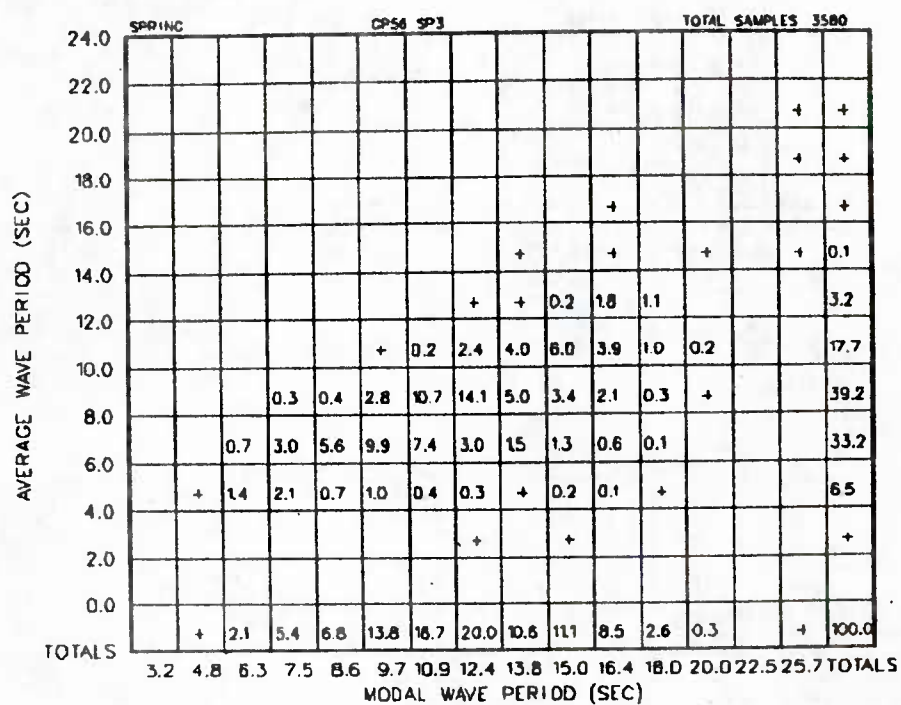


Figure A-056-3-9 Average Wave Period vs.
Modal Wave Period

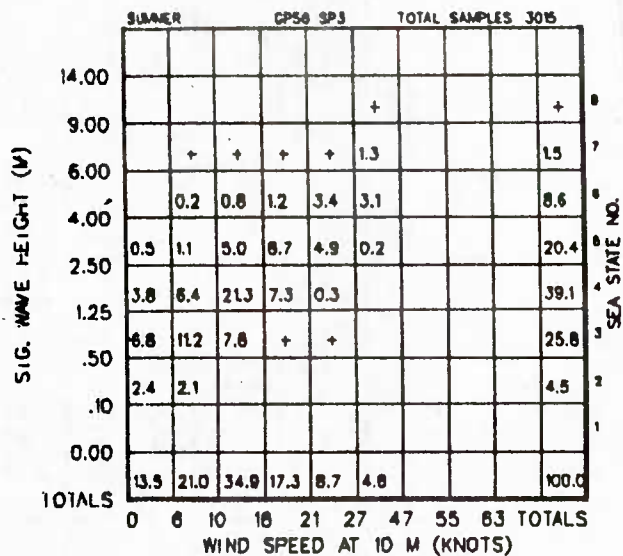


Figure A-056-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

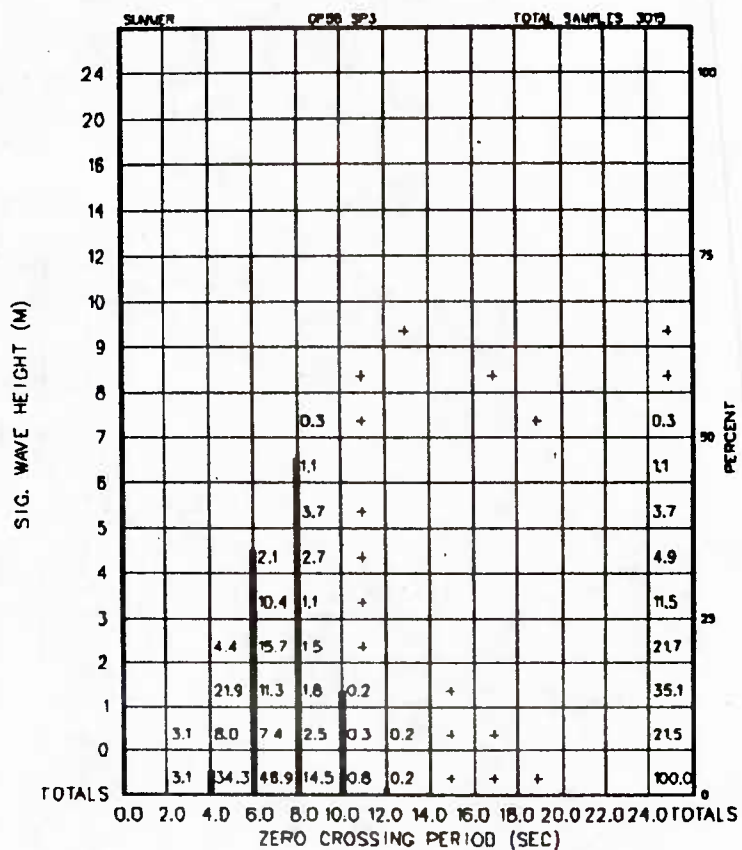


Figure A-056-4-6 Significant Wave Height vs. Zero Crossing Period

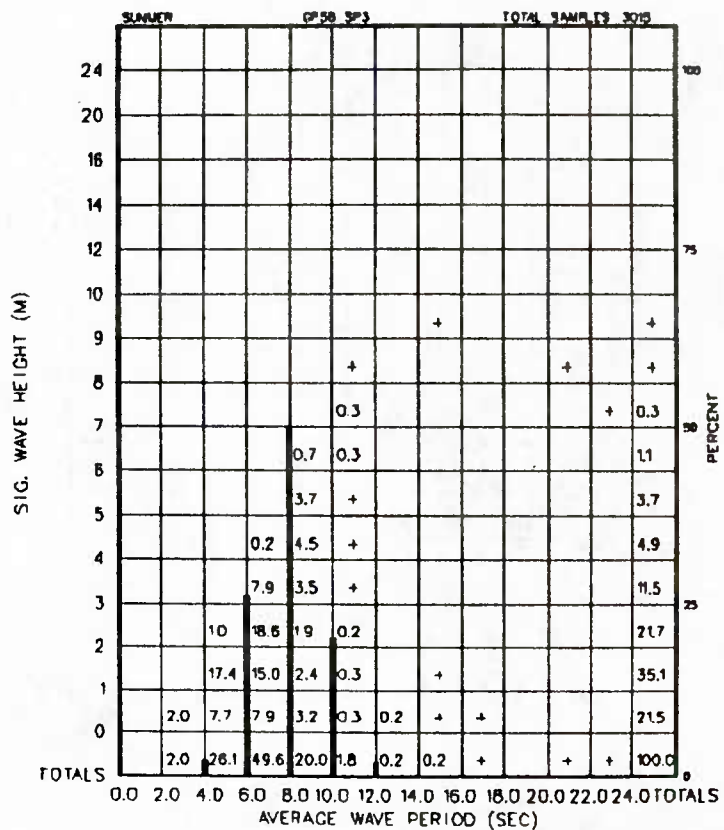


Figure A-056-4-7 Significant Wave Height vs. Average Wave Period

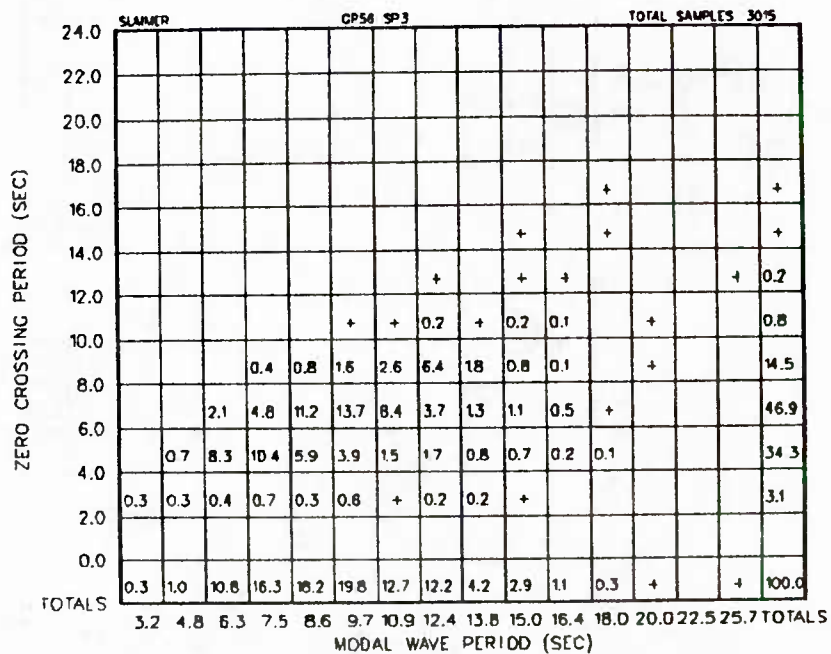


Figure A-056-4-8 Zero Crossing Period vs. Modal Wave Period

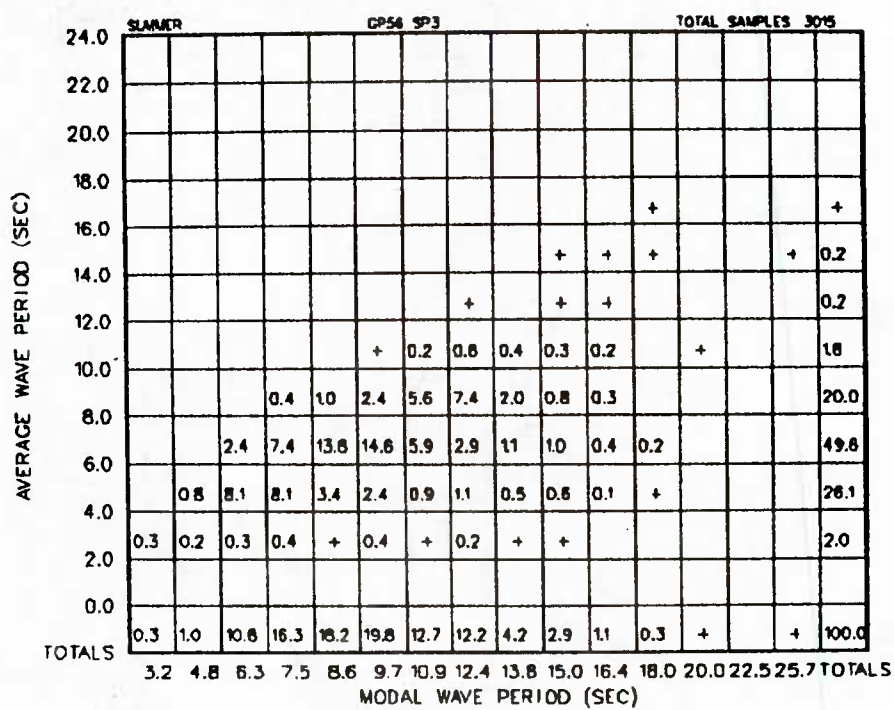


Figure A-056-4-9 Average Wave Period vs.
Modal Wave Period

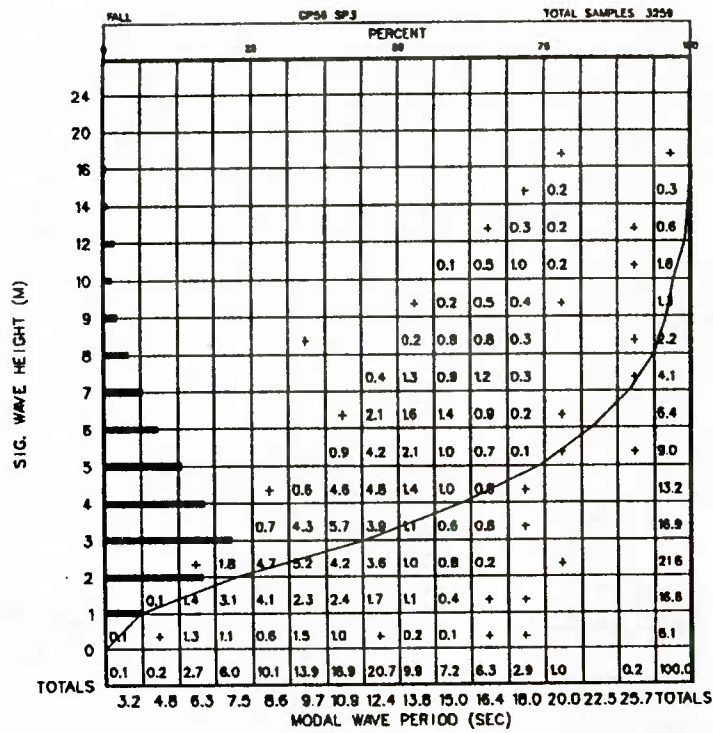


Figure A-056-5-1 Significant Wave Height vs. Modal Wave Period

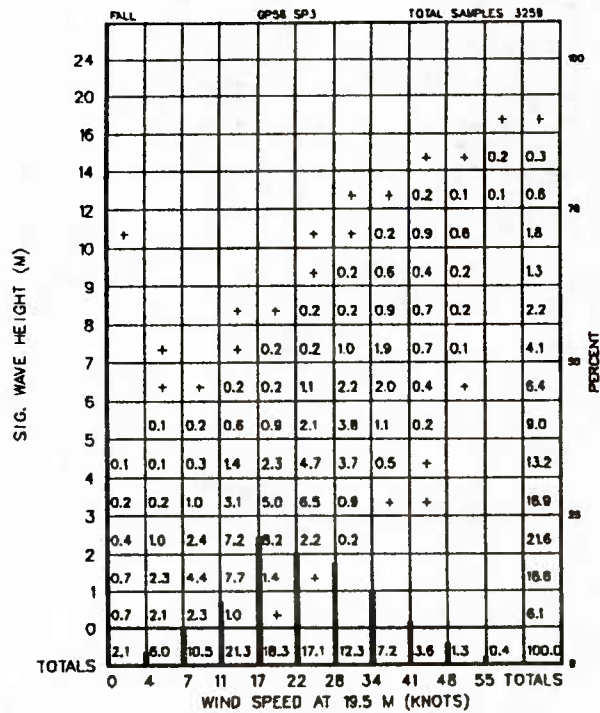


Figure A-056-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

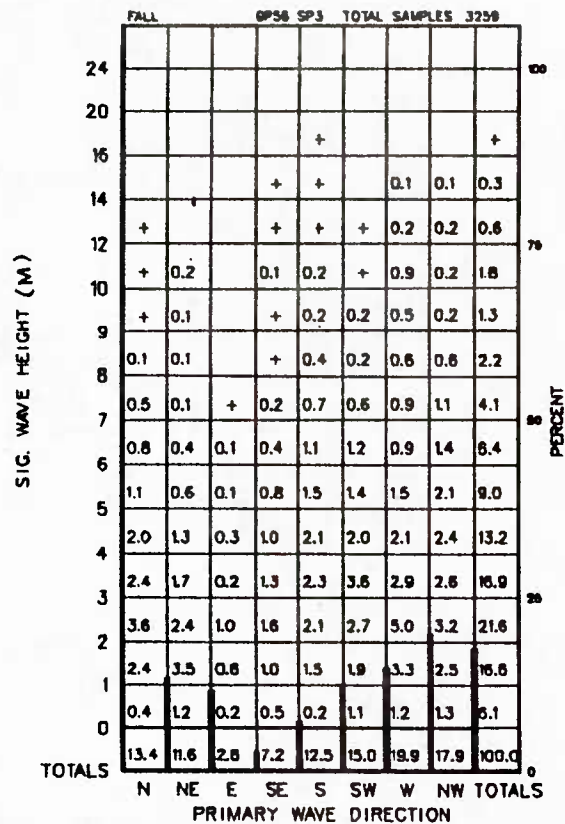


Figure A-056-5-3 Significant Wave Height vs. Primary Wave Direction

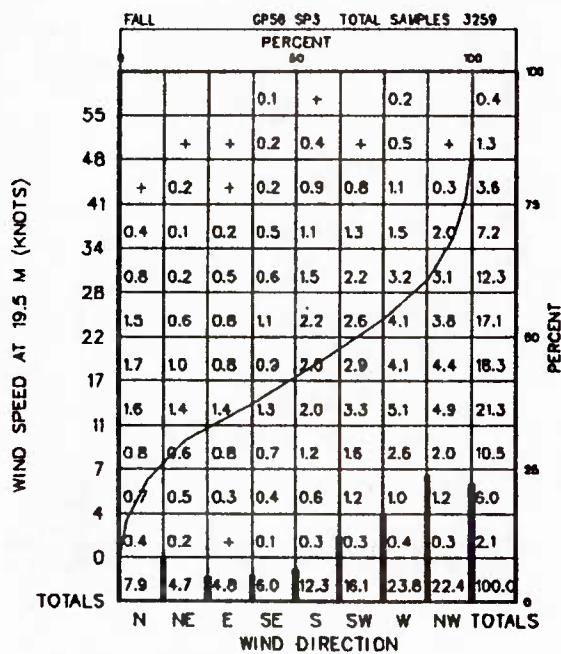


Figure A-056-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

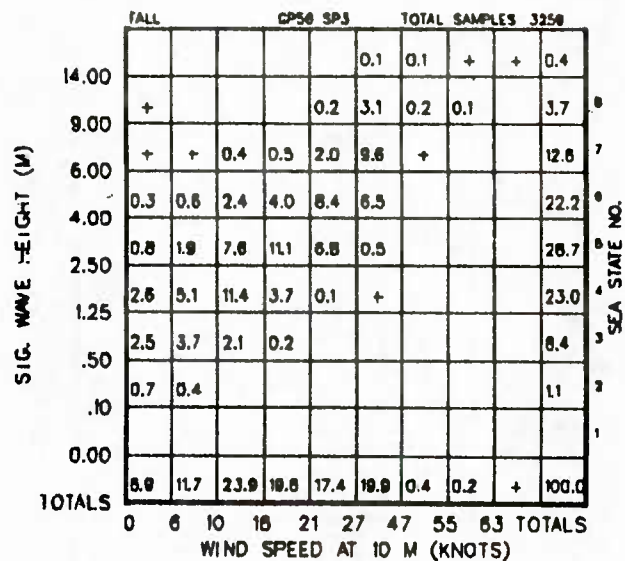


Figure A-056-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

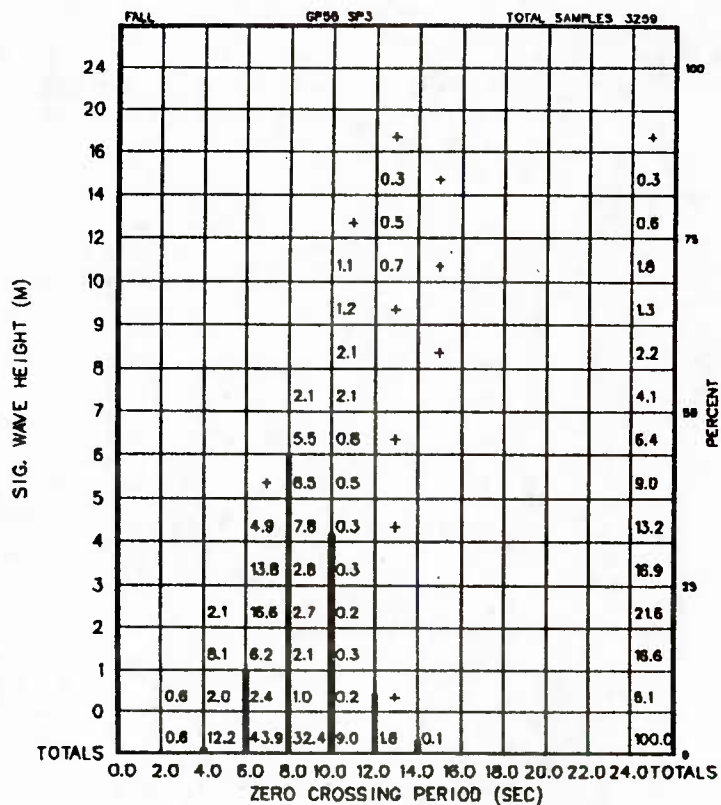


Figure A-056-5-6 Significant Wave Height vs. Zero Crossing Period

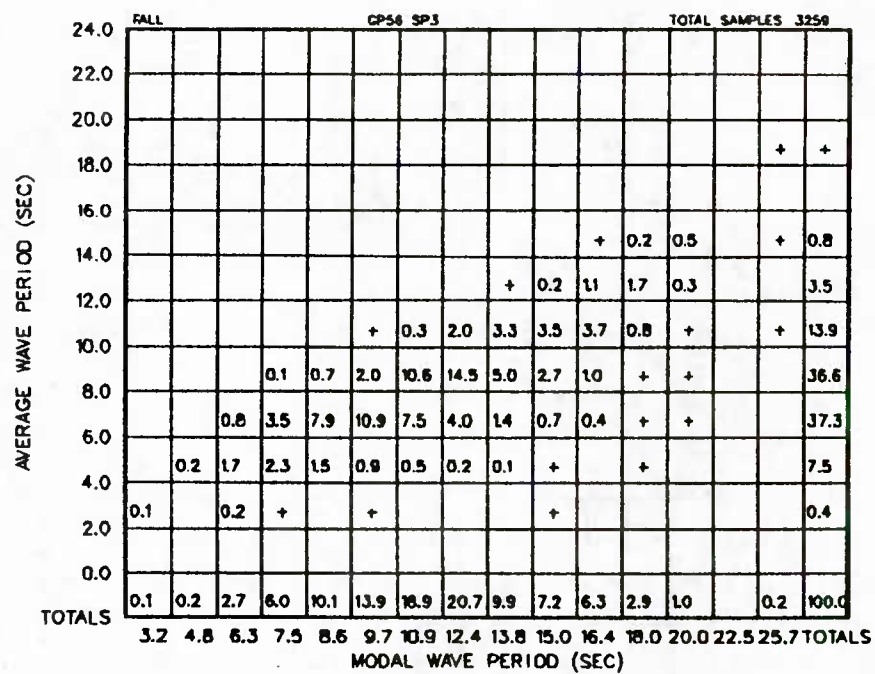


Figure A-056-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-039-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 37.52°N, 158.01°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6 -	2.5 11.5 -	7.5 18.5 -	3 12 -	2.5 12.4 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 1 -	14 2.5 -	34.5 7 -	16 3 -	14 2.5 SW
Visibility, nautical miles	3	15	25		
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 12% of the time				
Relative Humidity, %	60	82	98	-	-
Air Temperature, °C	12	16	20	16	-
Sea Surface Temperature, °C	16	19	22	-	-
Sea Level Pressure, millibars	1003	1022	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	325 - -	- 2% 2%

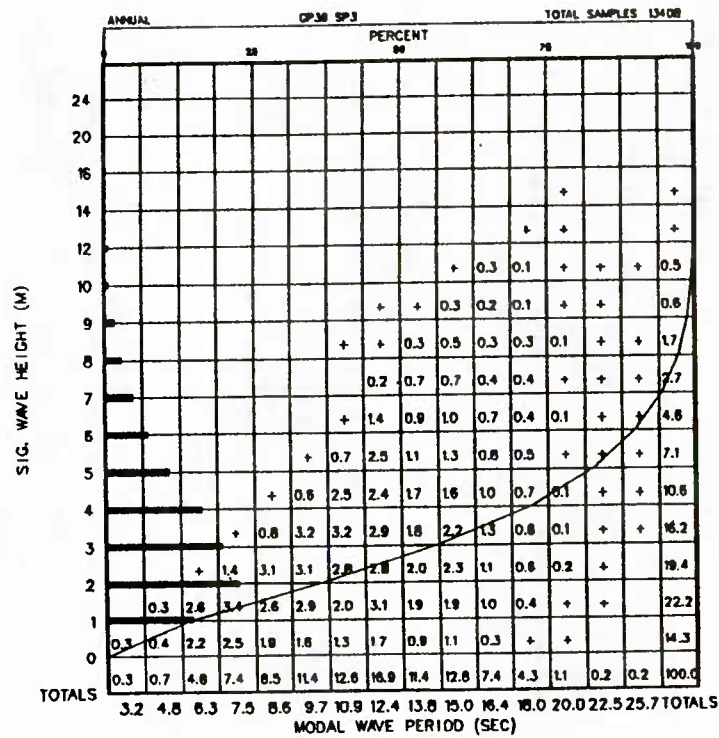


Figure A-039-1-1 Significant Wave Height vs. Modal Wave Period

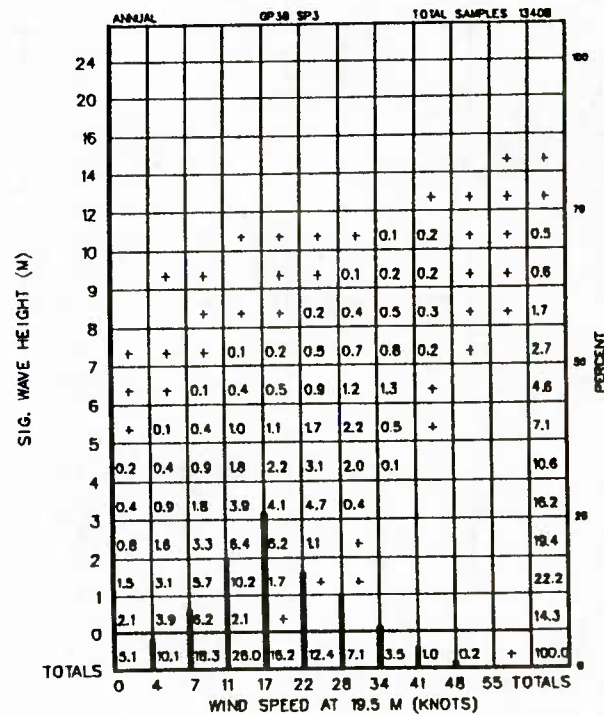


Figure A-039-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

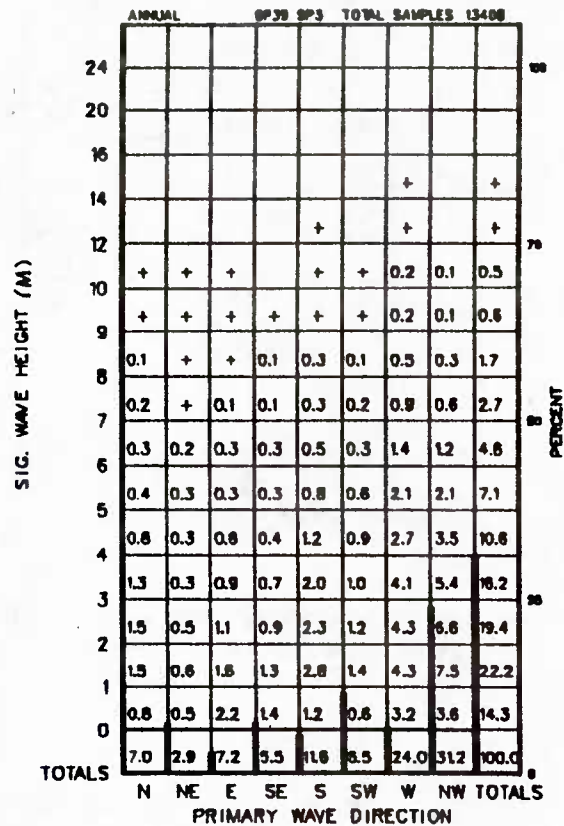


Figure A-039-1-3 Significant Wave Height vs. Primary Wave Direction

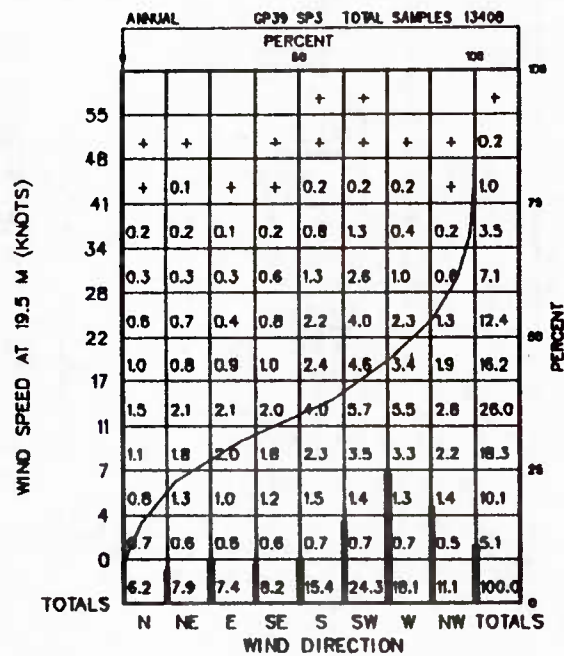


Figure A-039-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

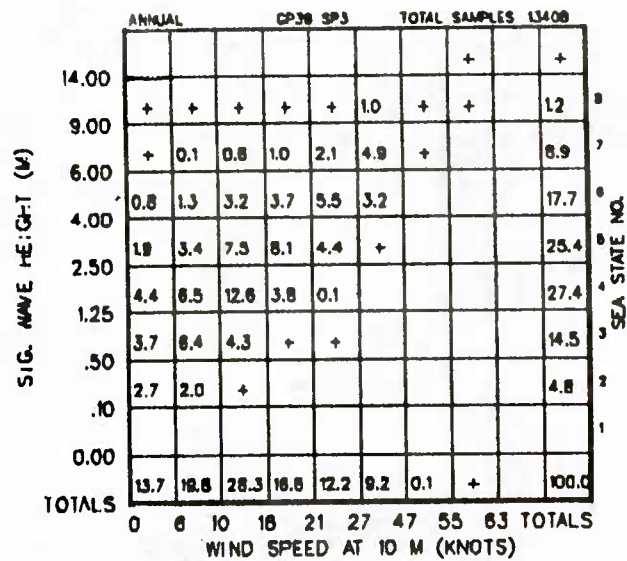


Figure A-039-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

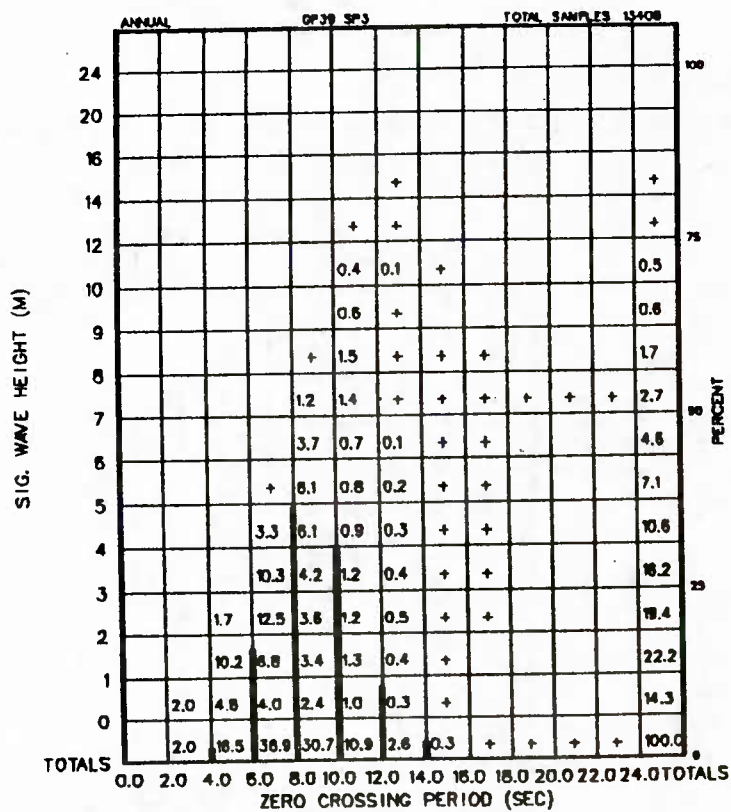


Figure A-039-1-6 Significant Wave Height vs. Zero Crossing Period

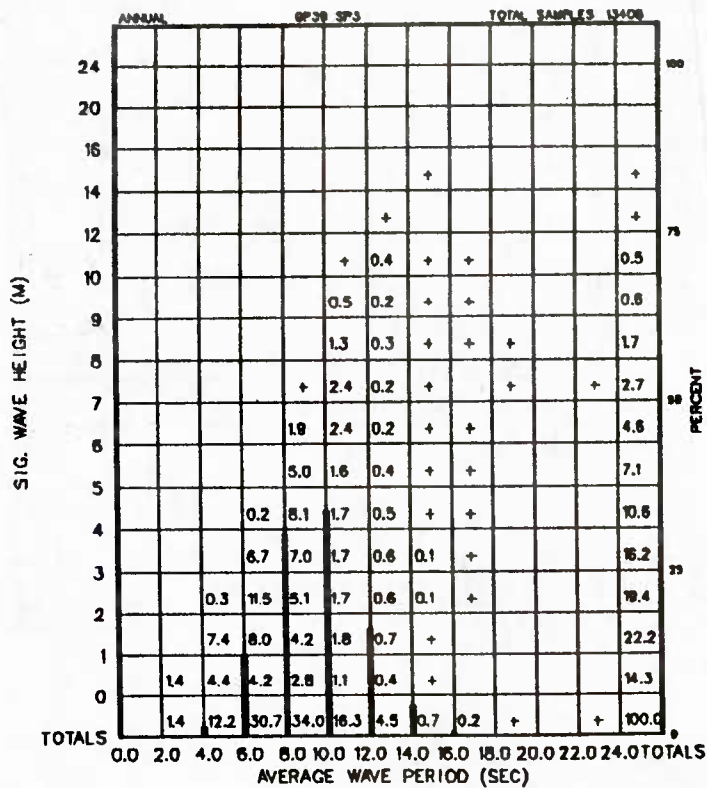


Figure A-039-1-7 Significant Wave Height vs. Average Wave Period

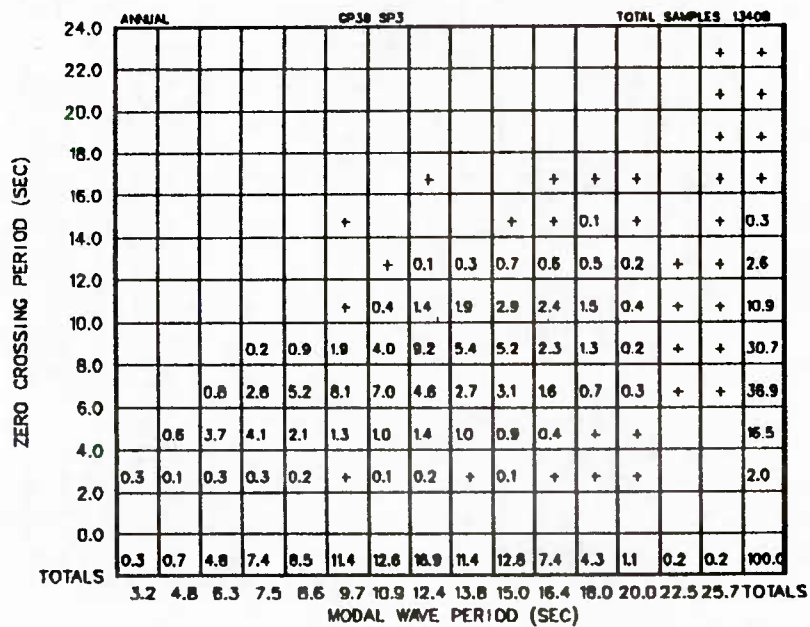


Figure A-039-1-8 Zero Crossing Period vs. Modal Wave Period

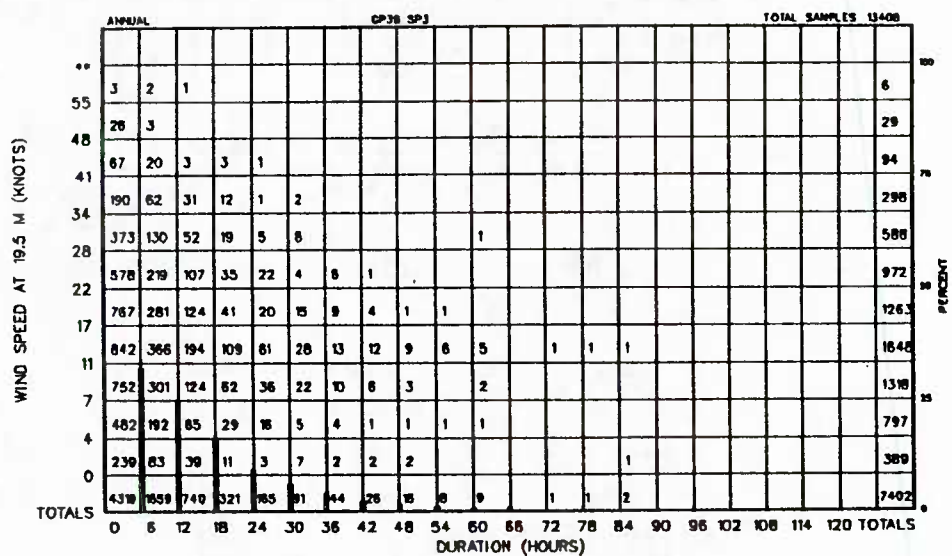


Figure A-039-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

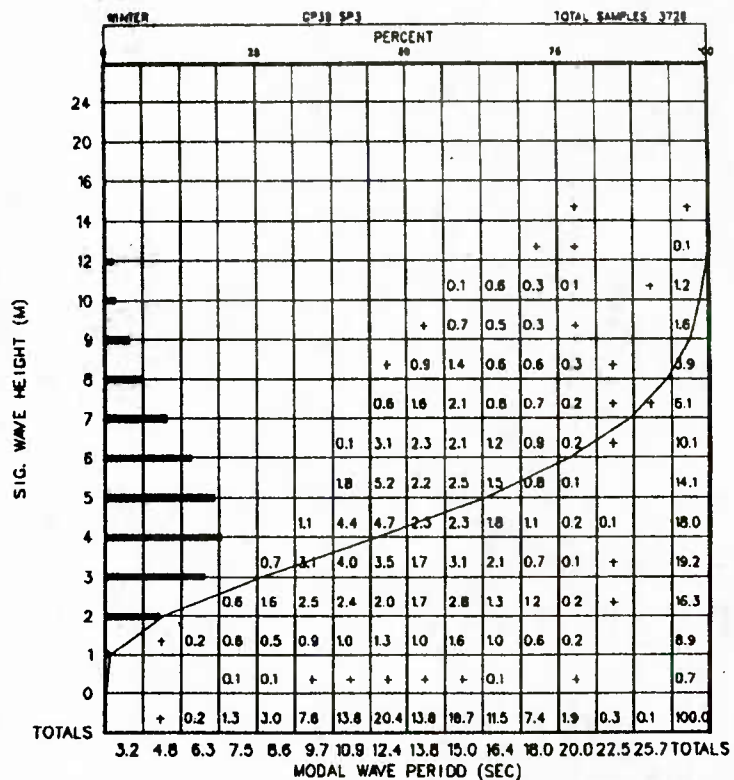


Figure A-039-2-1 Significant Wave Height vs. Modal Wave Period

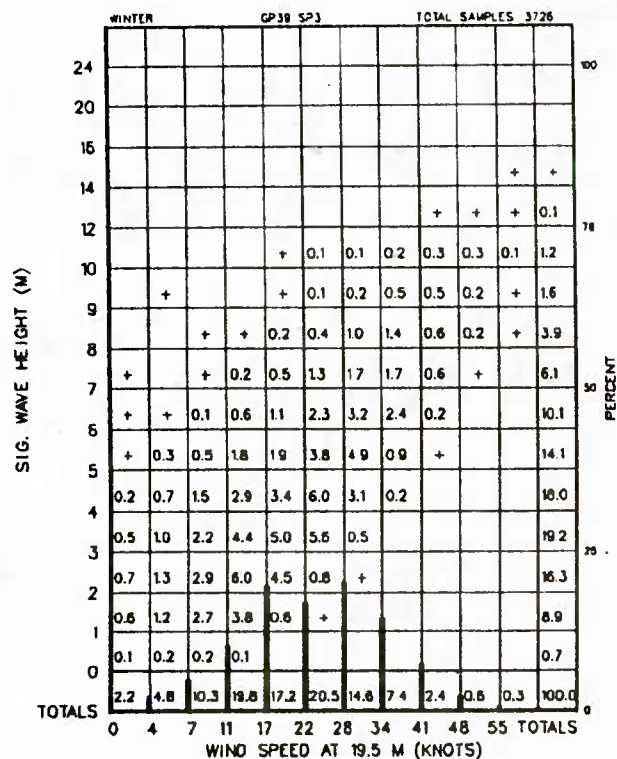


Figure A-039-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

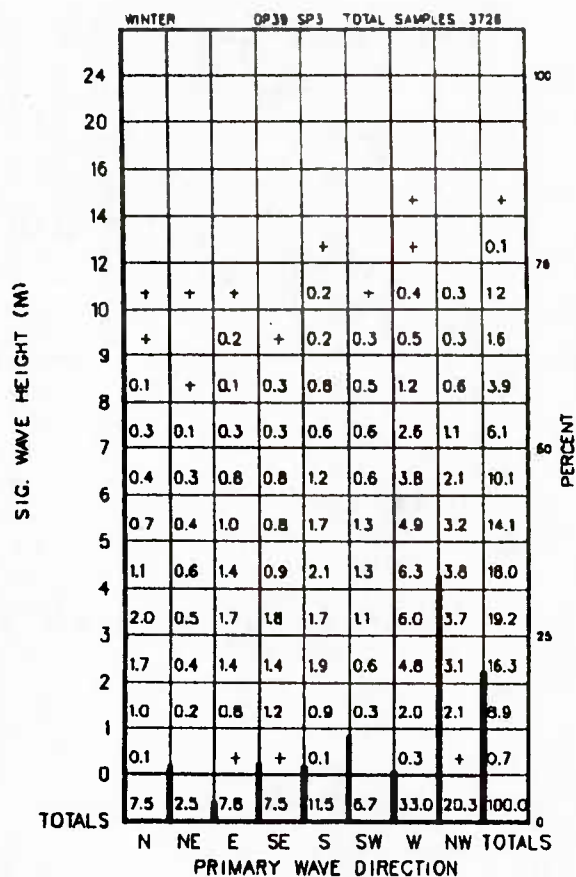


Figure A-039-2-3 Significant Wave Height vs. Primary Wave Direction

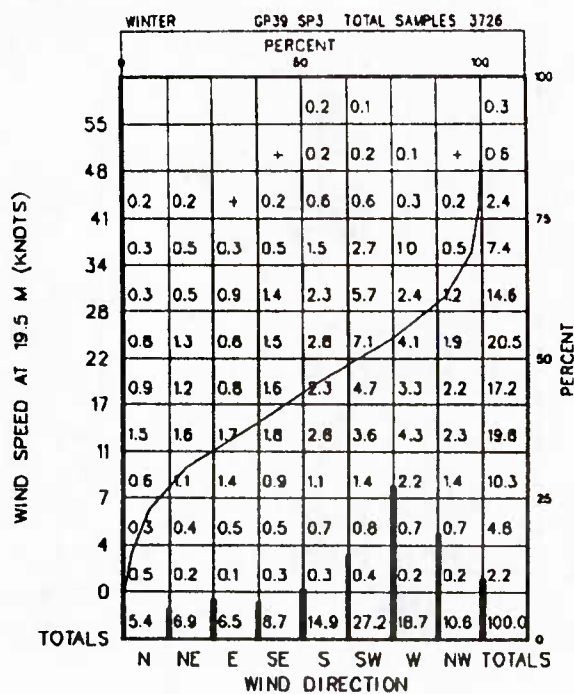


Figure A-039-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

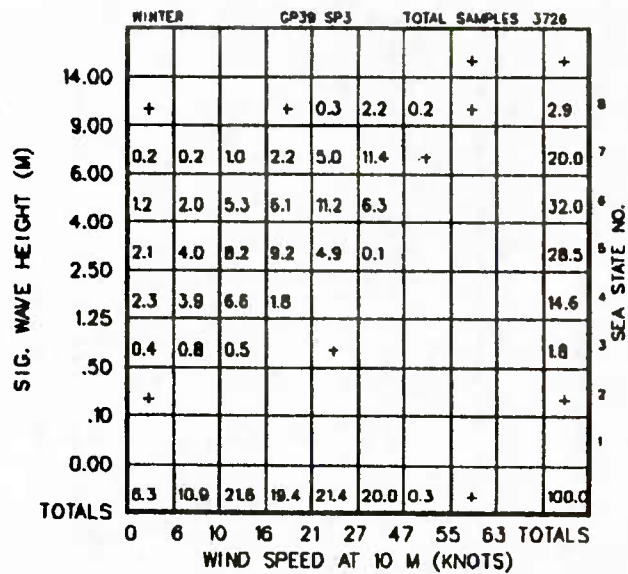


Figure A-039-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

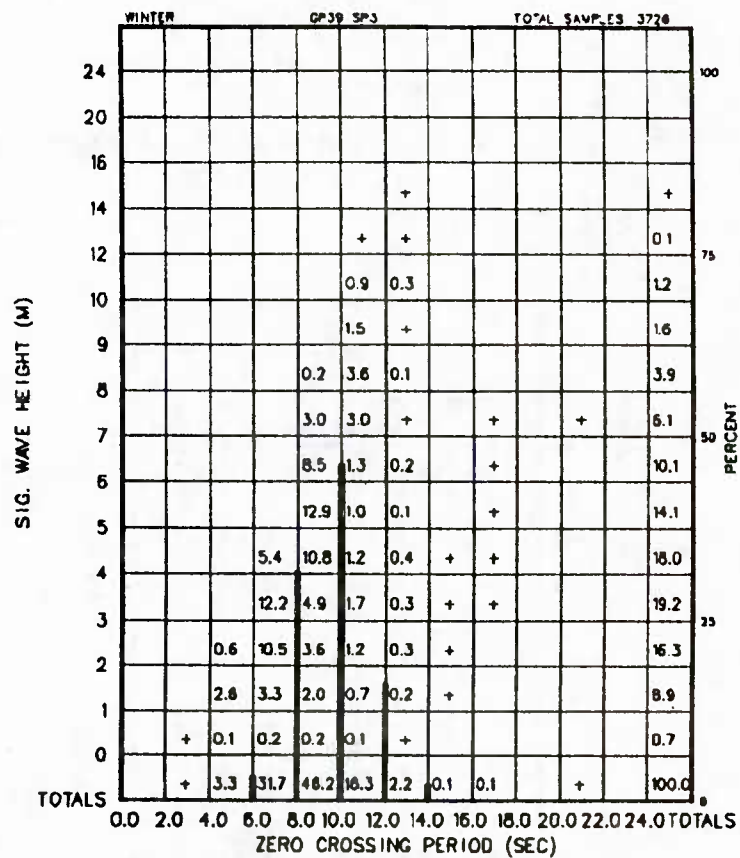


Figure A-039-2-6 Significant Wave Height vs. Zero Crossing Period

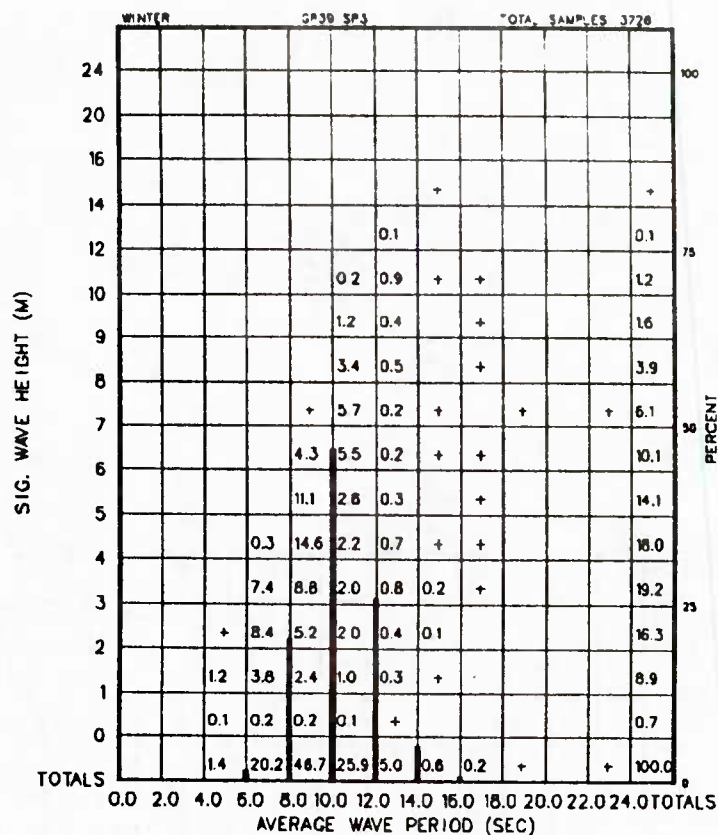


Figure A-039-2-7 Significant Wave Height vs. Average Wave Period

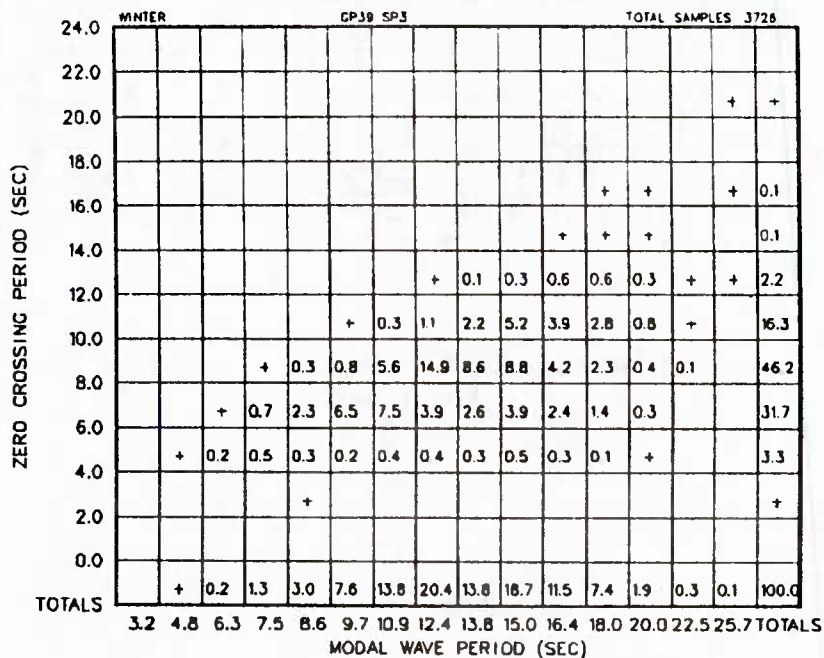


Figure A-039-2-8 Zero Crossing Period vs. Modal Wave Period

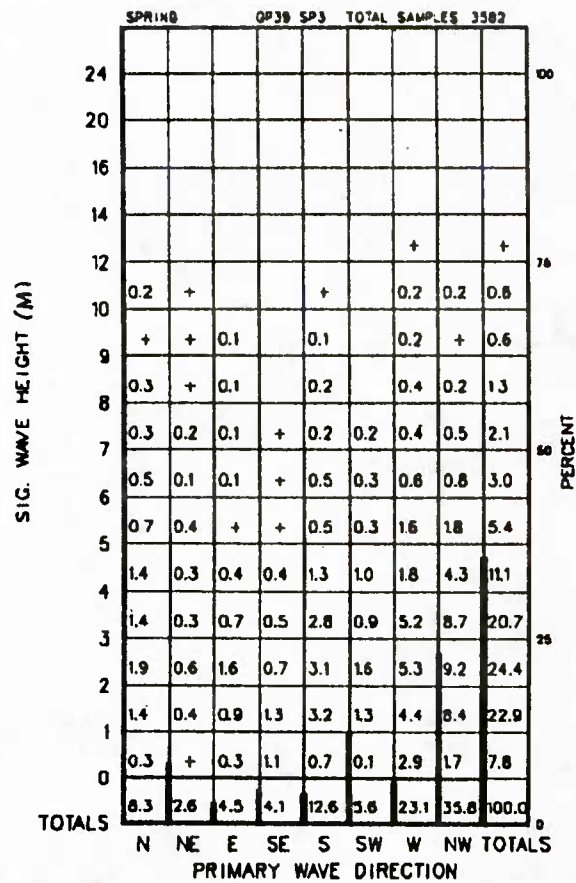


Figure A-039-3-3 Significant Wave Height vs. Primary Wave Direction

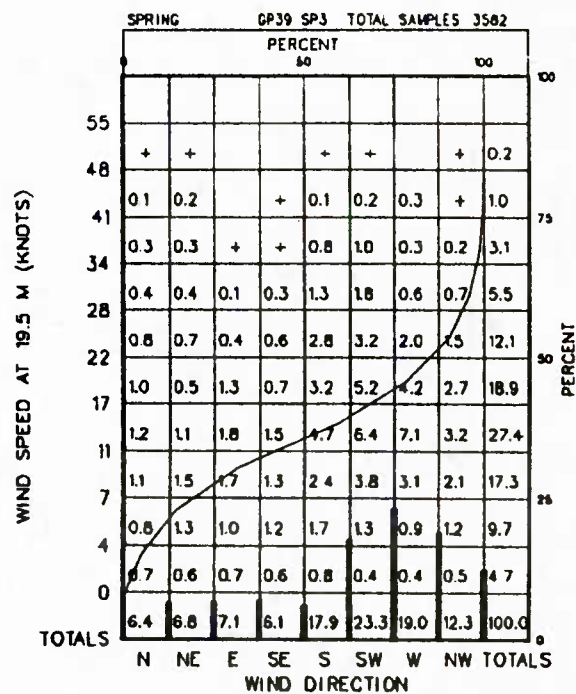


Figure A-039-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

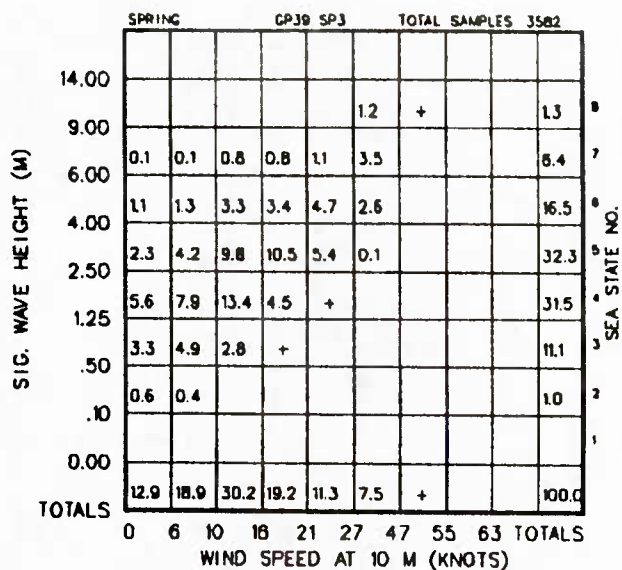


Figure A-039-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

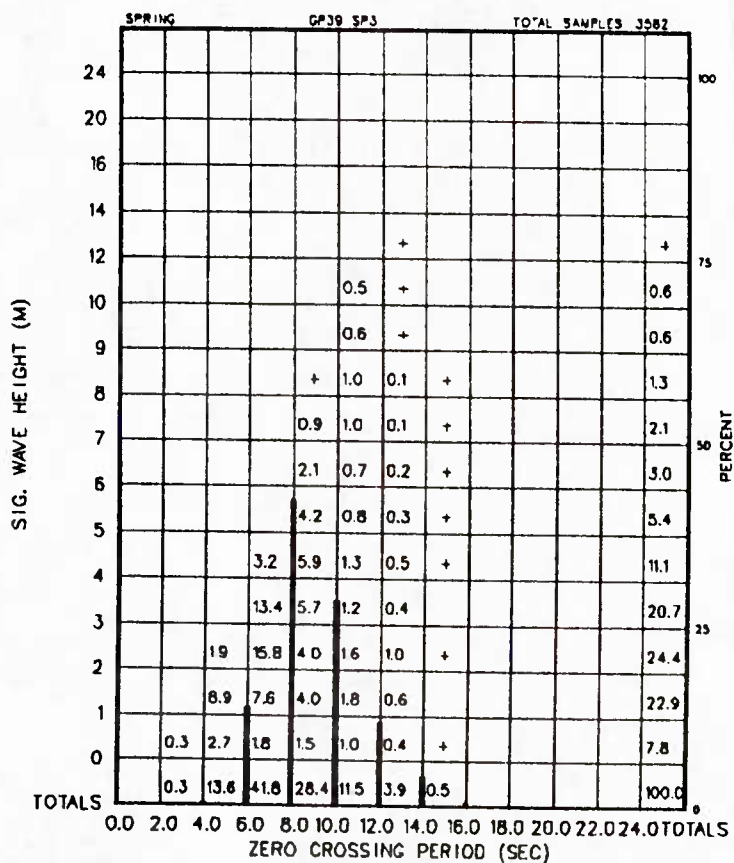
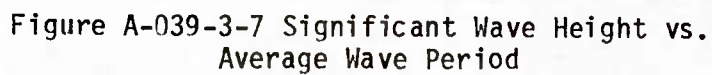


Figure A-039-3-6 Significant Wave Height vs. Zero Crossing Period



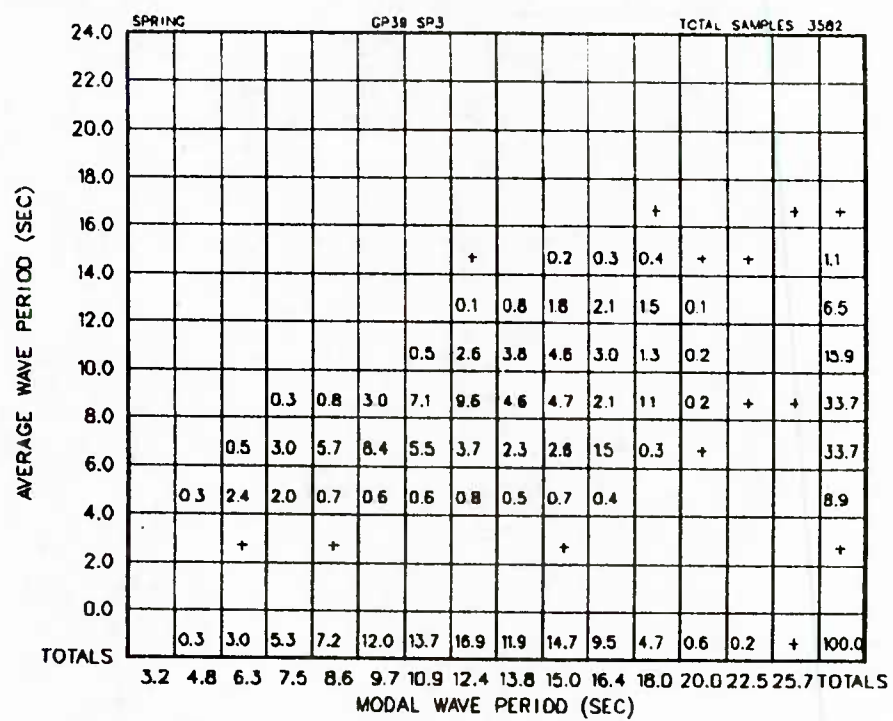


Figure A-039-3-9 Average Wave Period vs.
Modal Wave Period

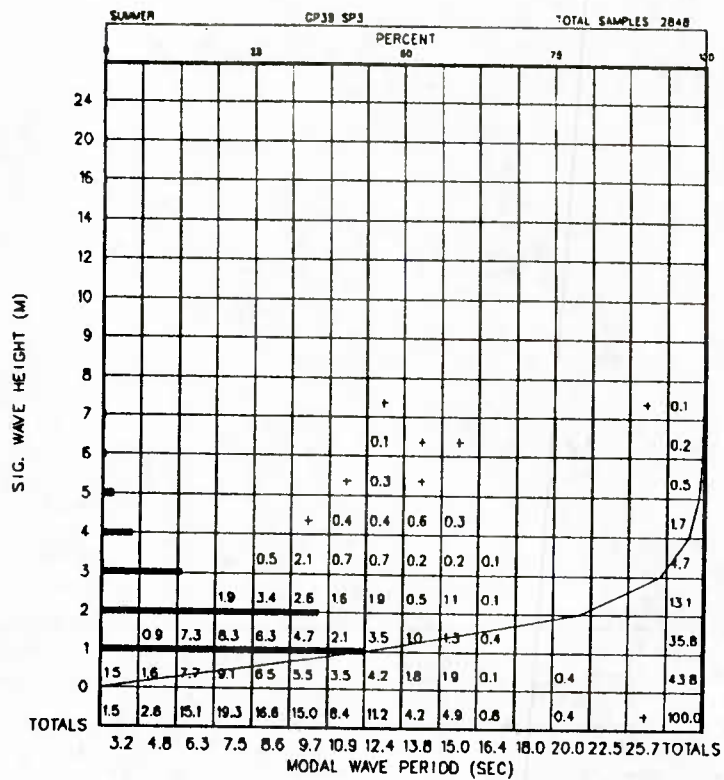


Figure A-039-4-1 Significant Wave Height vs. Modal Wave Period

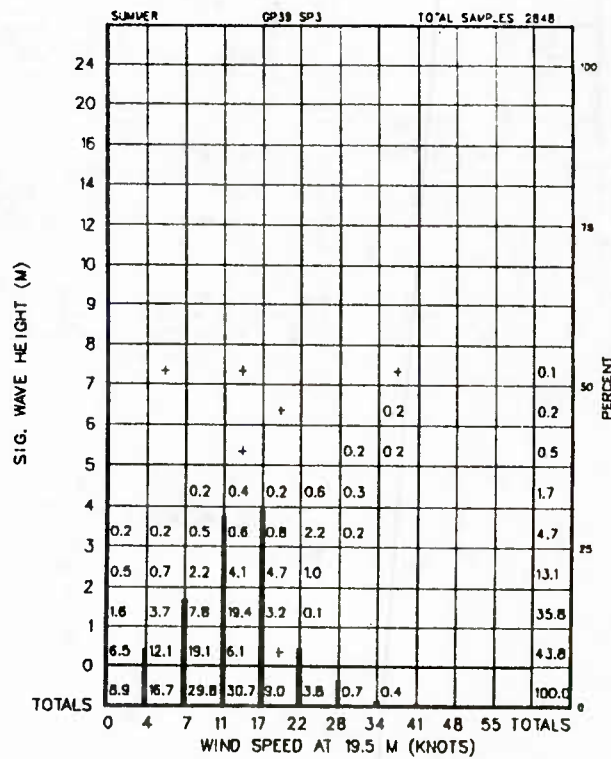


Figure A-039-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

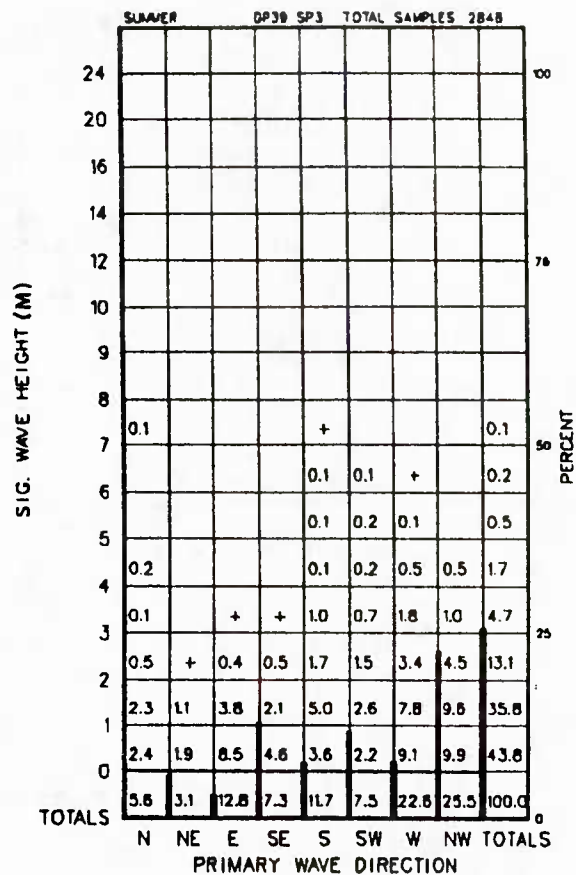


Figure A-039-4-3 Significant Wave Height vs. Primary Wave Direction

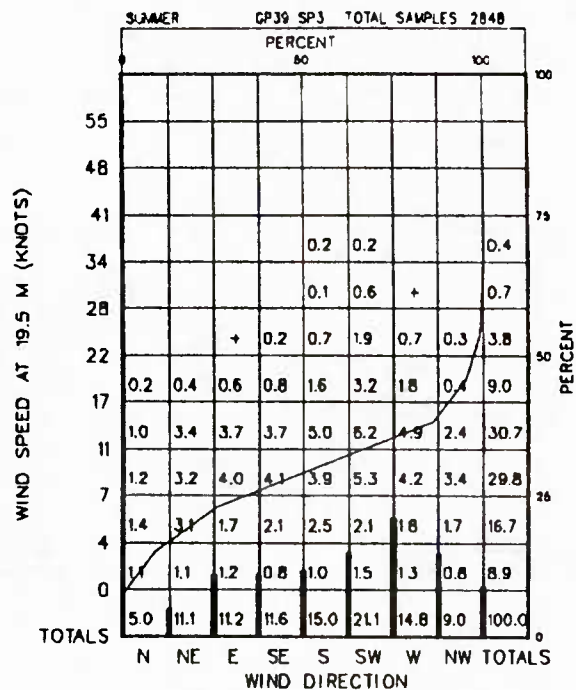


Figure A-039-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

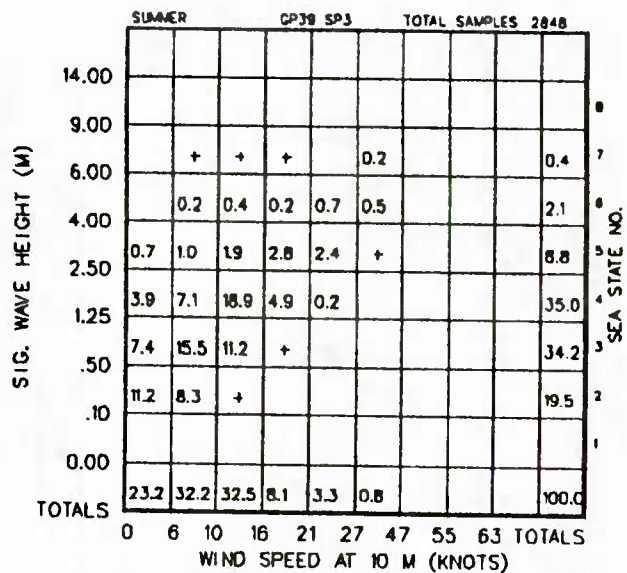


Figure A-039-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

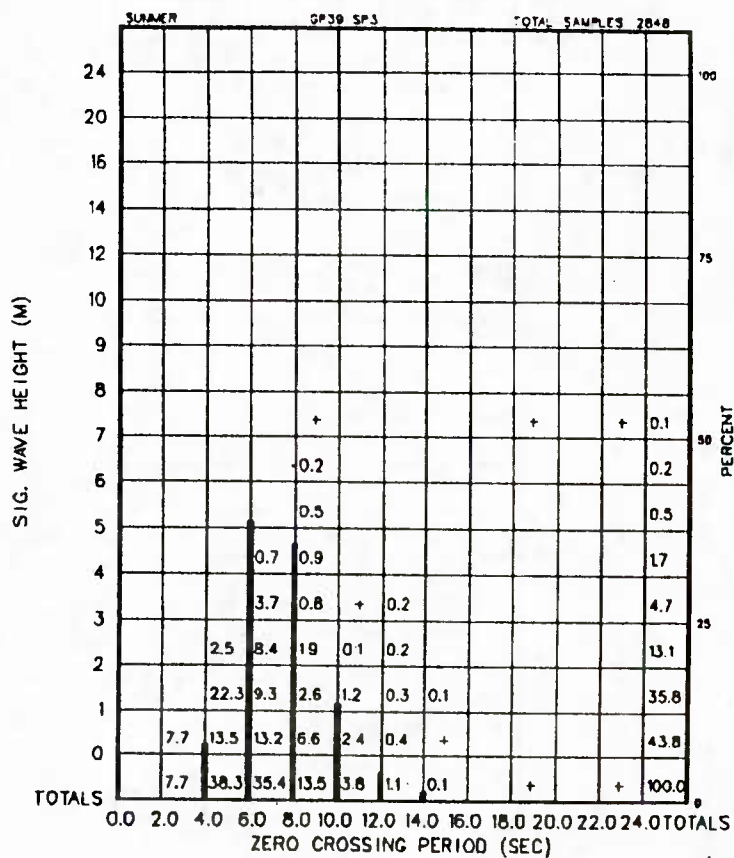
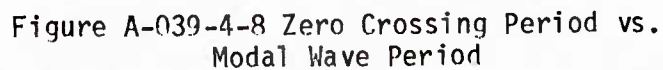
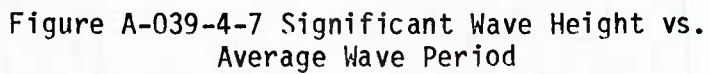


Figure A-039-4-6 Significant Wave Height vs. Zero Crossing Period



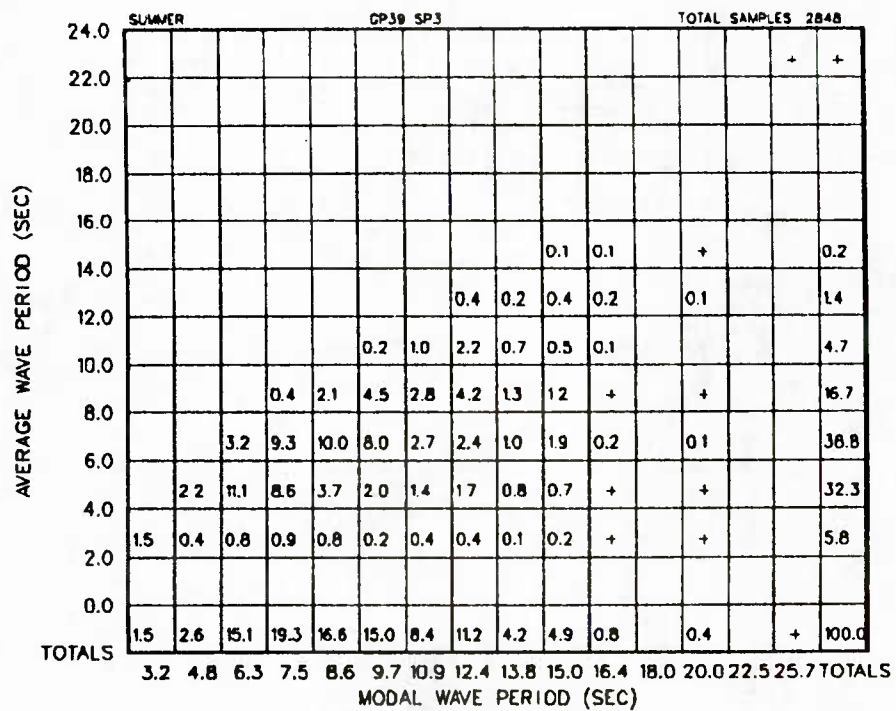


Figure A-039-4-9 Average Wave Period vs.
Modal Wave Period

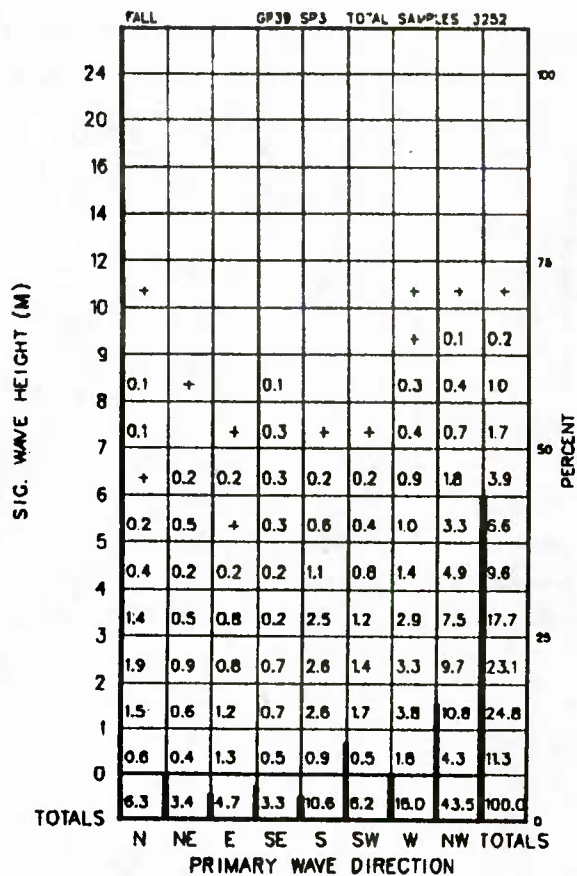


Figure A-039-5-3 Significant Wave Height vs. Primary Wave Direction

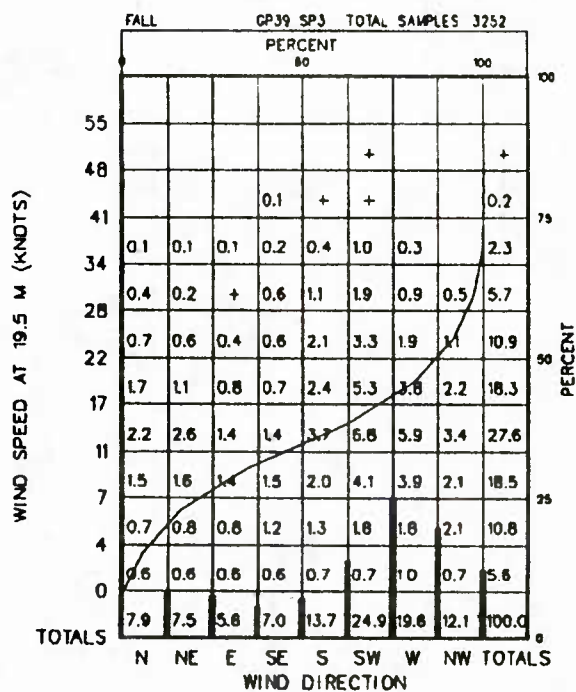


Figure A-039-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

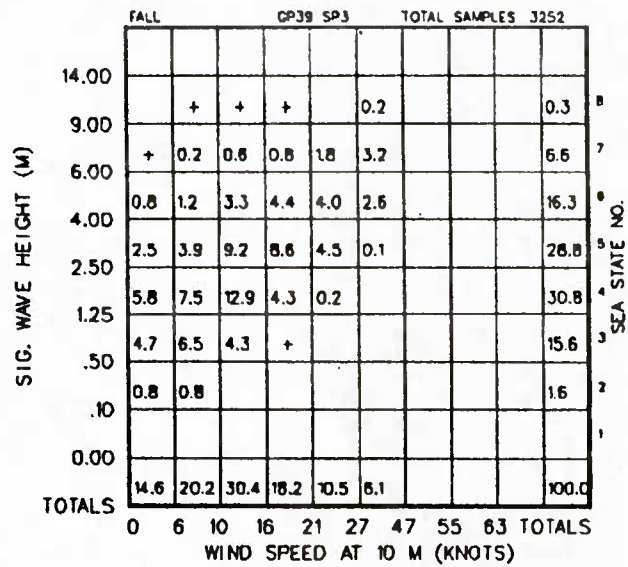


Figure A-039-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

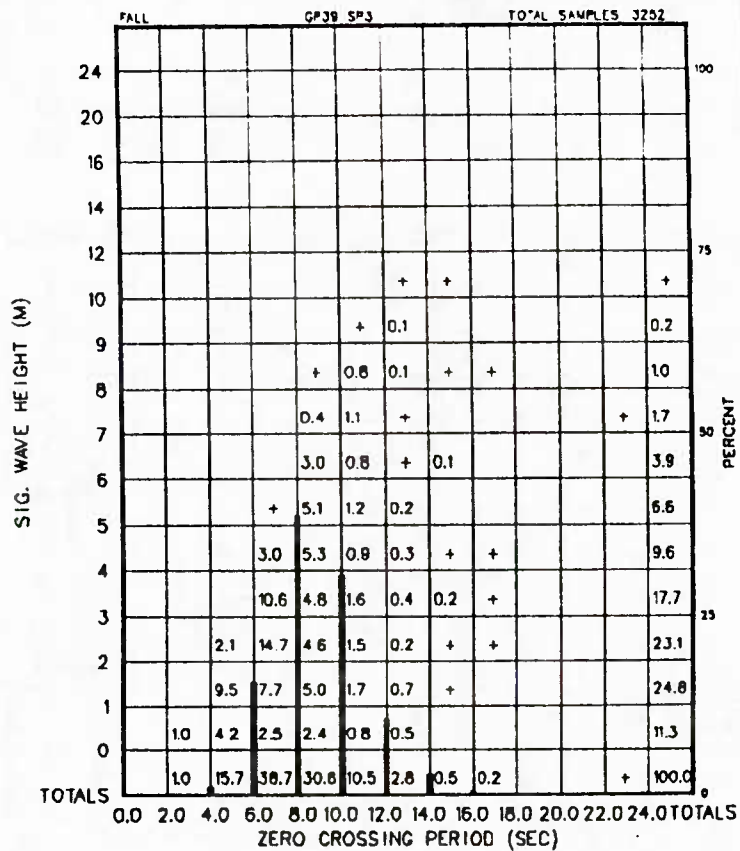


Figure A-039-5-6 Significant Wave Height vs. Zero Crossing Period

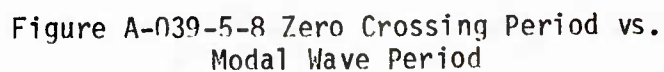
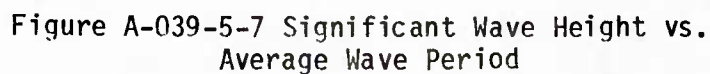




TABLE A-088-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.9°N, 145.58°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 11 -	6 17.5 -	2.25 11.75 -	1.5 12.4 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12 2 -	32.5 5.25 -	13.5 2.25 -	14 2.5 S
Visibility, nautical miles	5	18	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 6	8 8	- -	- -
Precipitation (Occurrence)					
All precipitation - 10% of the time					
Relative Humidity, %	58	78	96	-	-
Air Temperature, °C	12.5	16	19.5	16	-
Sea Surface Temperature, °C	16.5	19	21.5	-	-
Sea Level Pressure, millibars	1005	1023	1034	-	-
Ice	None				
Refractivity					
Mean Surface Refractivity	-	-	-	343	-
Sub-Refracton (1 km, Annual)	-	-	-	-	24
Super-Refracton or Ducting (1 km, Annual)	-	-	-	-	24

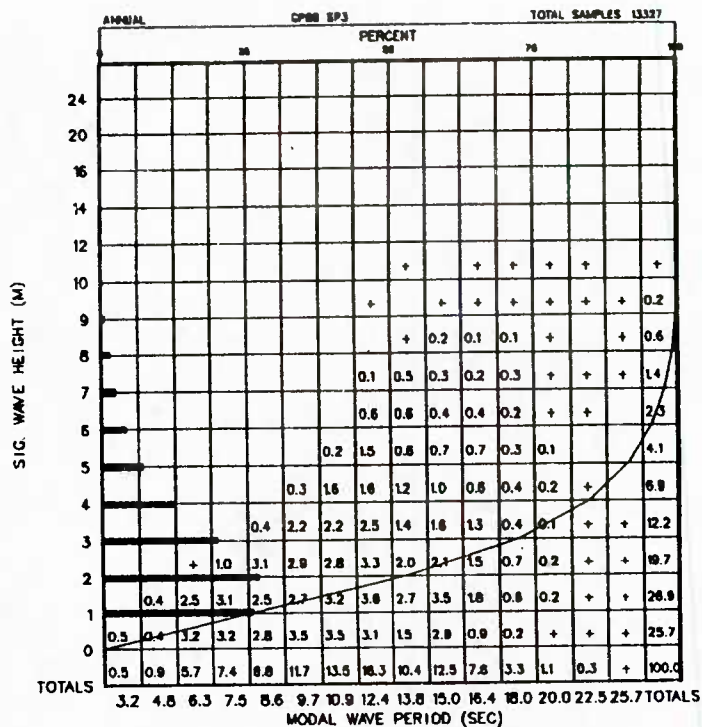


Figure A-088-1-1 Significant Wave Height vs. Modal Wave Period

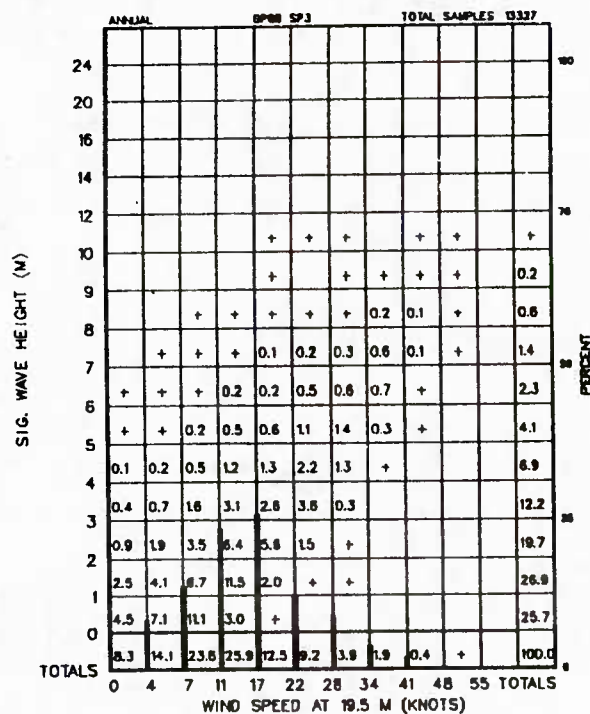


Figure A-088-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

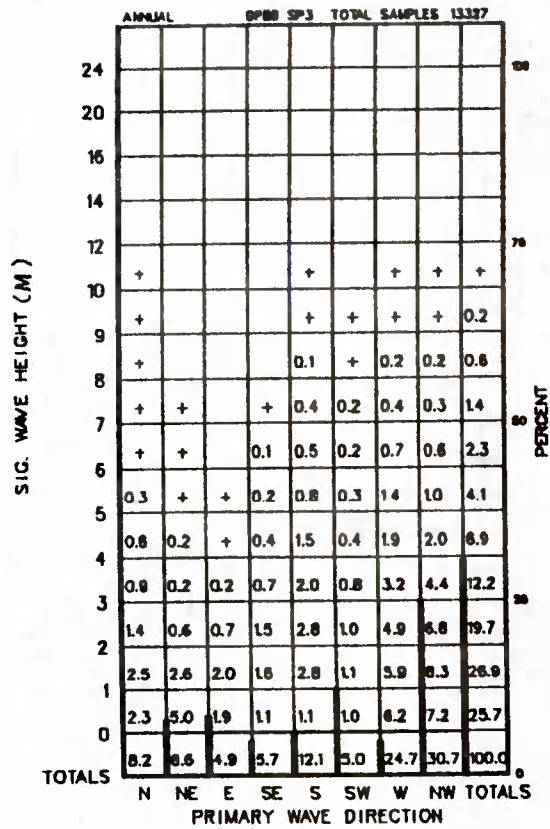


Figure A-088-1-3 Significant Wave Height vs. Primary Wave Direction

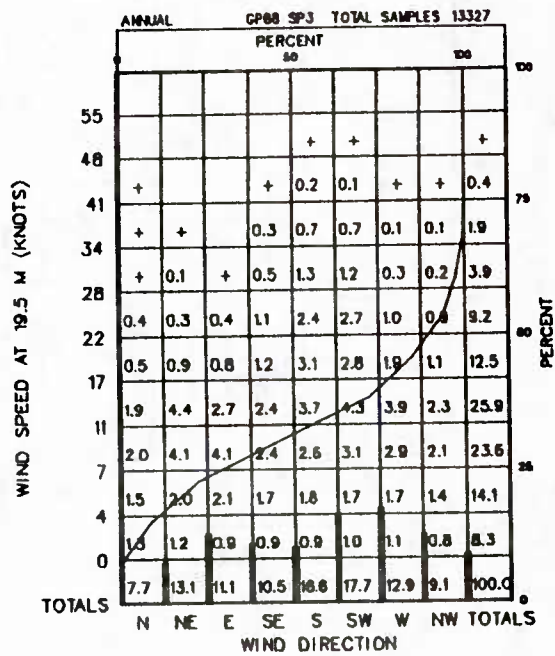


Figure A-088-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

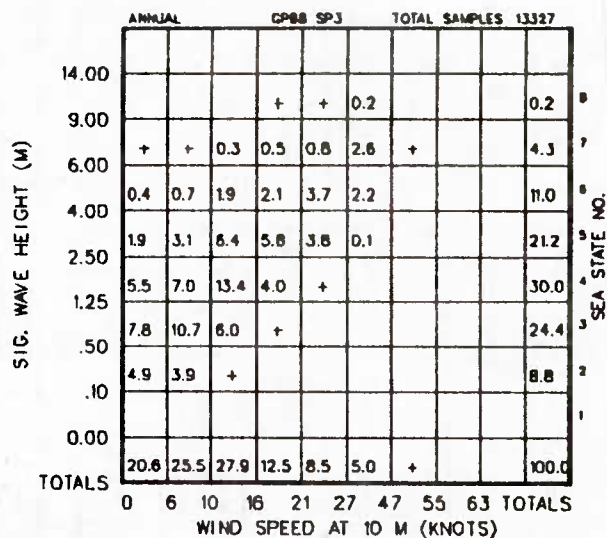


Figure A-088-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

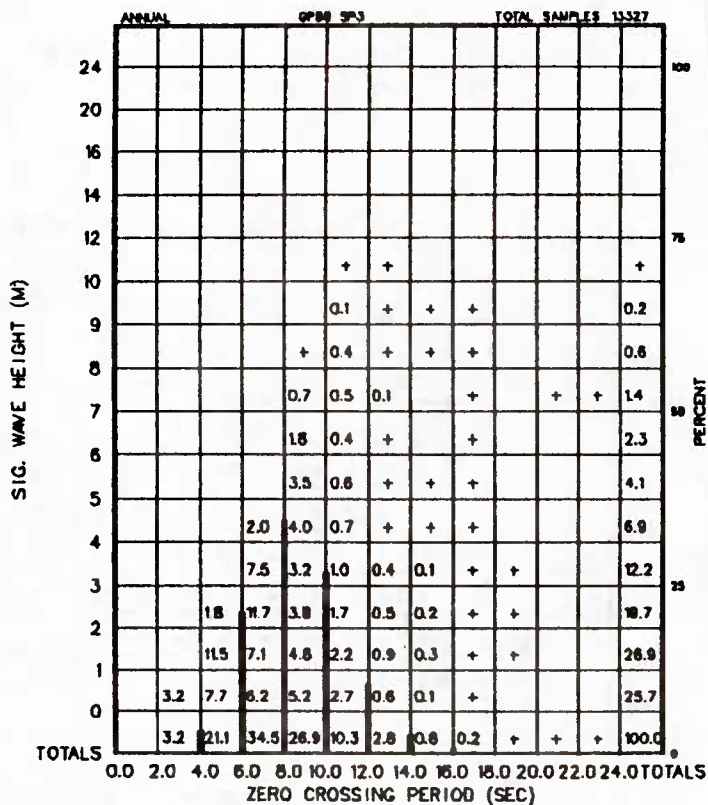


Figure A-088-1-6 Significant Wave Height vs. Zero Crossing Period

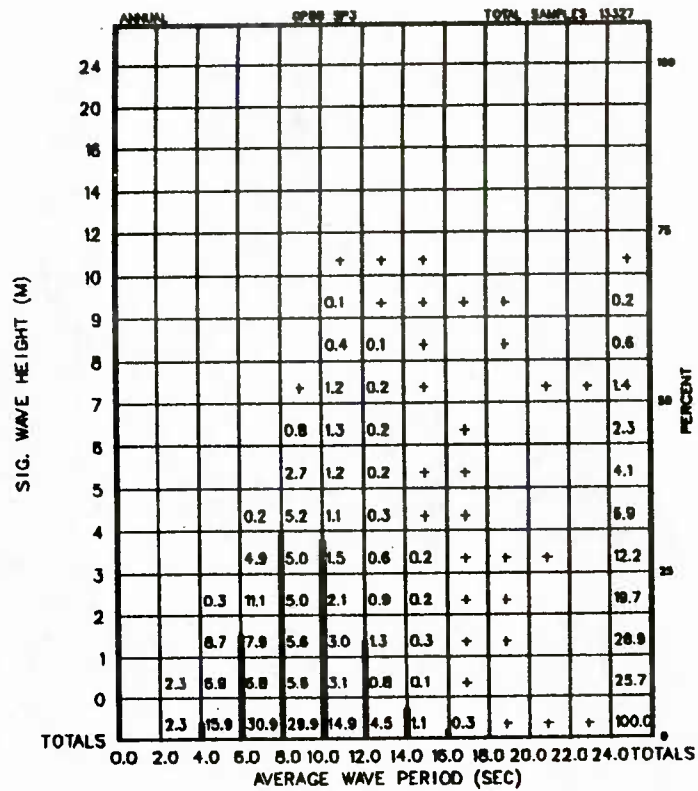


Figure A-088-1-7 Significant Wave Height vs. Average Wave Period

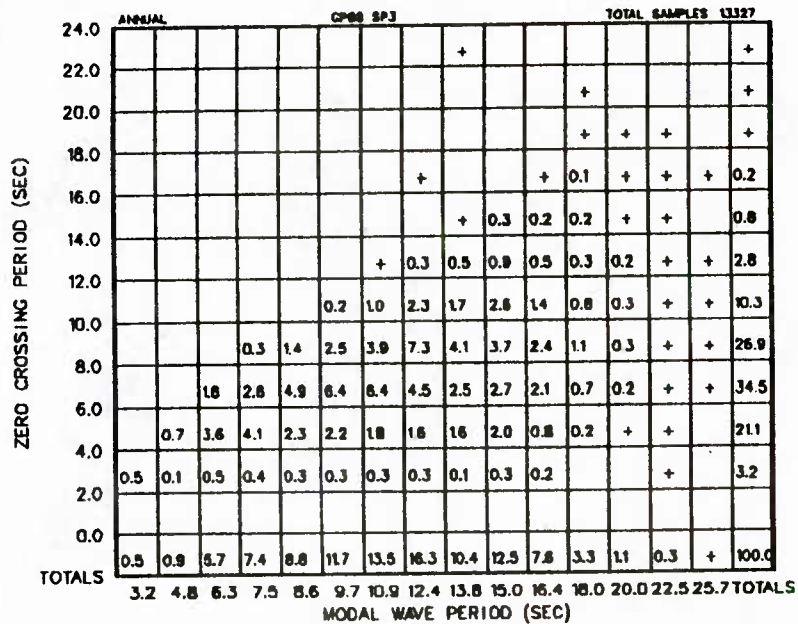


Figure A-088-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		DUR SP3												TOTAL SAMPLES 13397										
WIND SPEED AT 19.5 M (KNOTS)																PERCENT								
55																								
48	4	1																						5
41	23	12	1	1																				37
34	77	38	15	5	6				1															142
28	196	76	28	10	8	1	1																	320
22	373	185	87	35	16	8	5	2	2															671
17	540	217	88	50	21	9	4	2	1	1														933
11	638	305	181	98	81	31	23	18	7	11	9	9	3	7	2									1379
7	698	319	155	95	51	26	28	18	5	3	4	4		2	1						1			1408
4	583	250	99	48	25	13	4	3	6	2														1013
0	238	97	81	48	16	14	7	4	2	3		1												481
TOTALS	3348	1480	675	308	204	100	70	48	23	20	13	14	3	9	3						1			6399
	D	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS		
	DURATION (HOURS)																							

Figure A-088-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

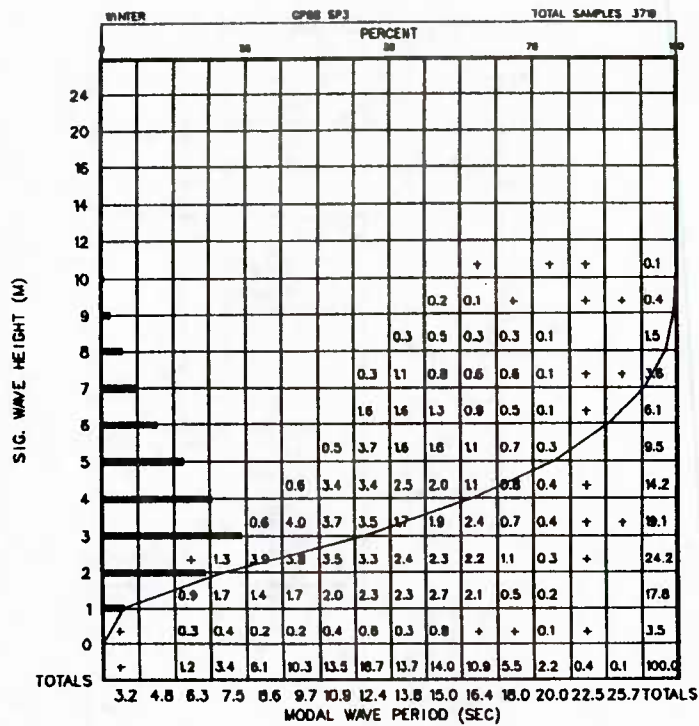


Figure A-088-2-1 Significant Wave Height vs. Modal Wave Period

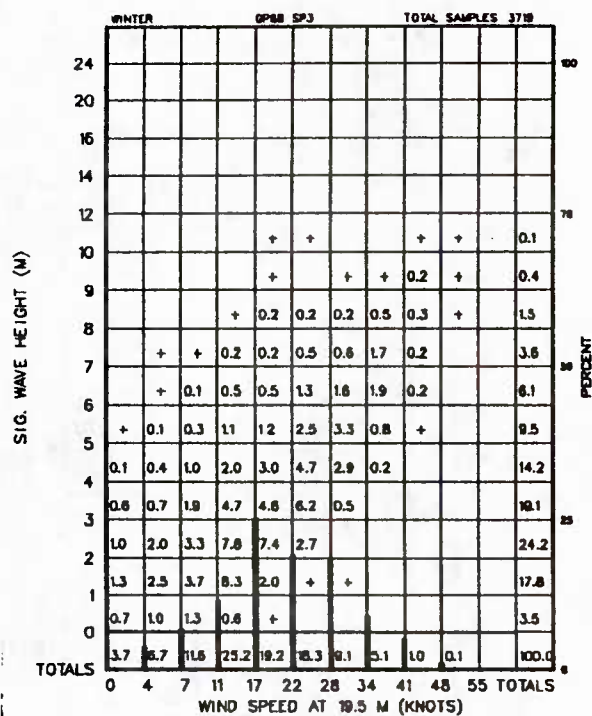


Figure A-088-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

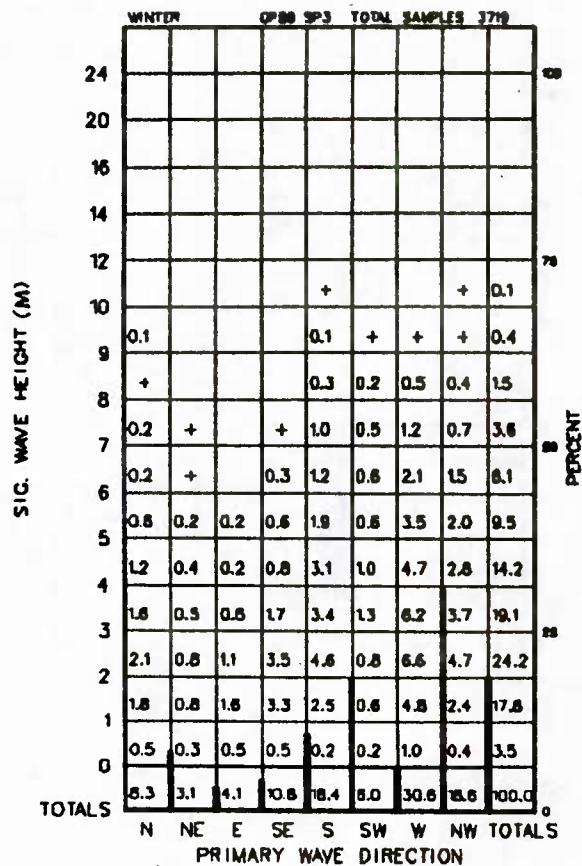


Figure A-088-2-3 Significant Wave Height vs. Primary Wave Direction

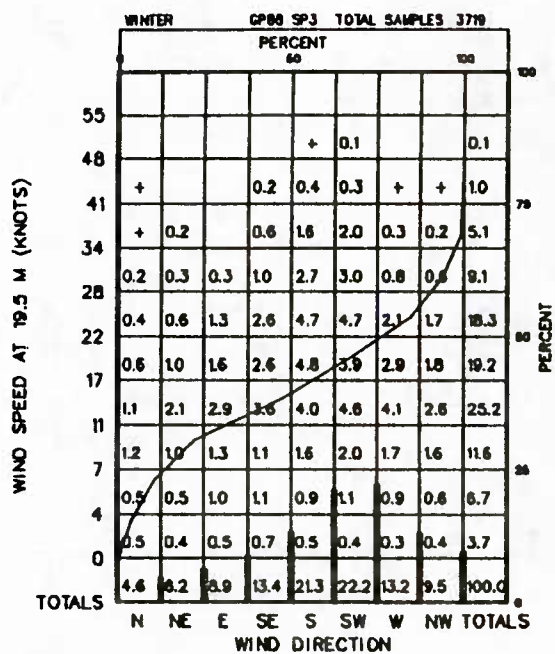


Figure A-088-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

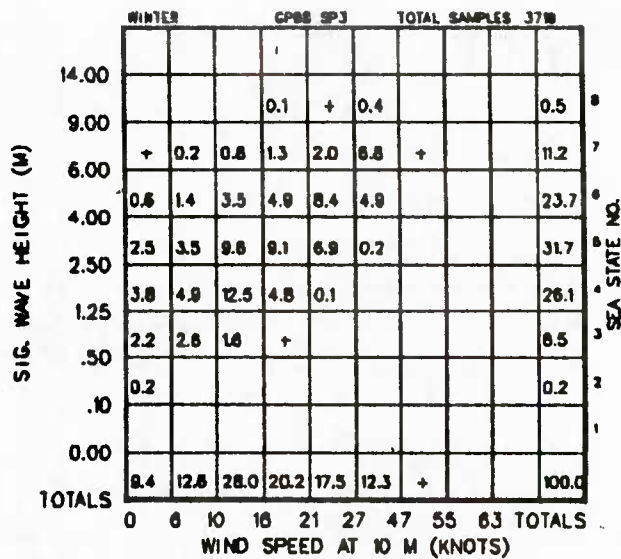


Figure A-088-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

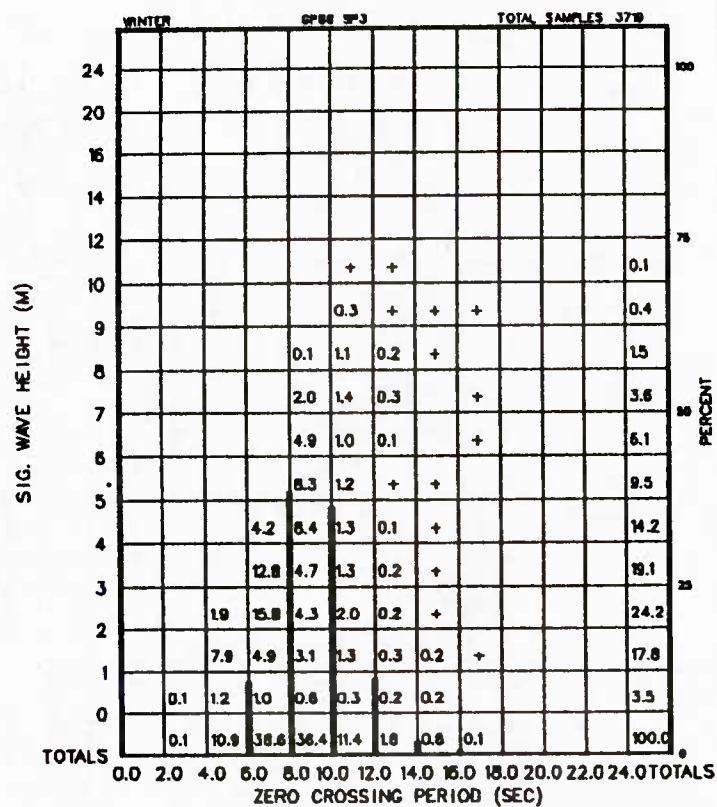
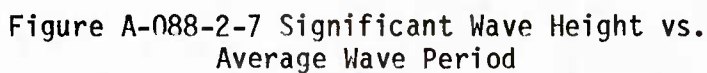


Figure A-088-2-6 Significant Wave Height vs. Zero Crossing Period





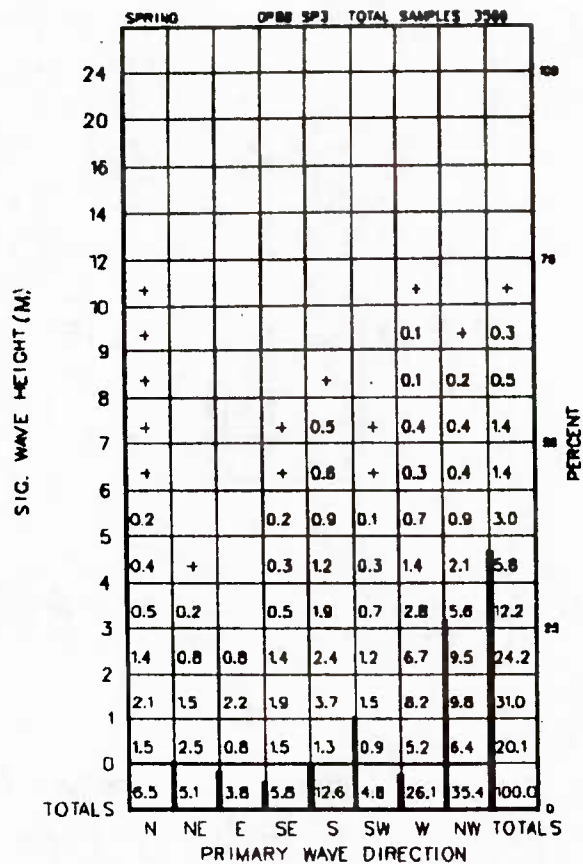


Figure A-088-3-3 Significant Wave Height vs. Primary Wave Direction

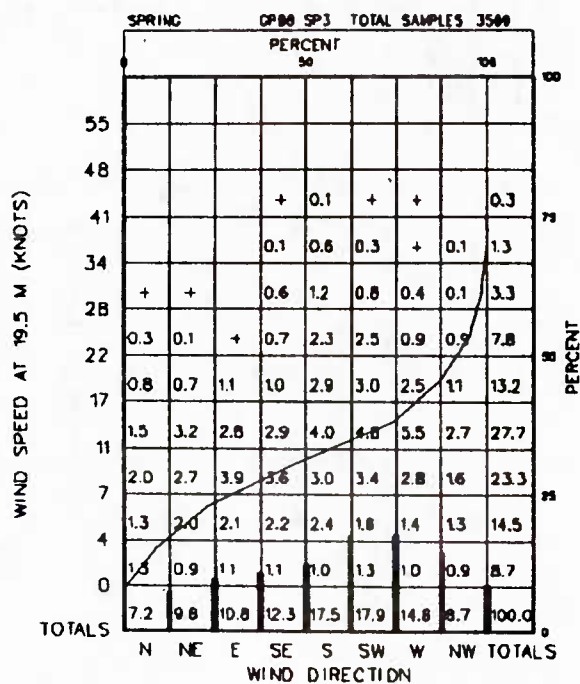


Figure A-088-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

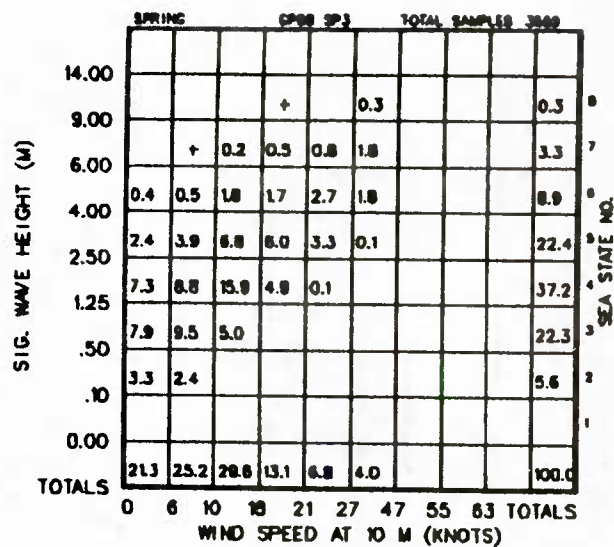


Figure A-088-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

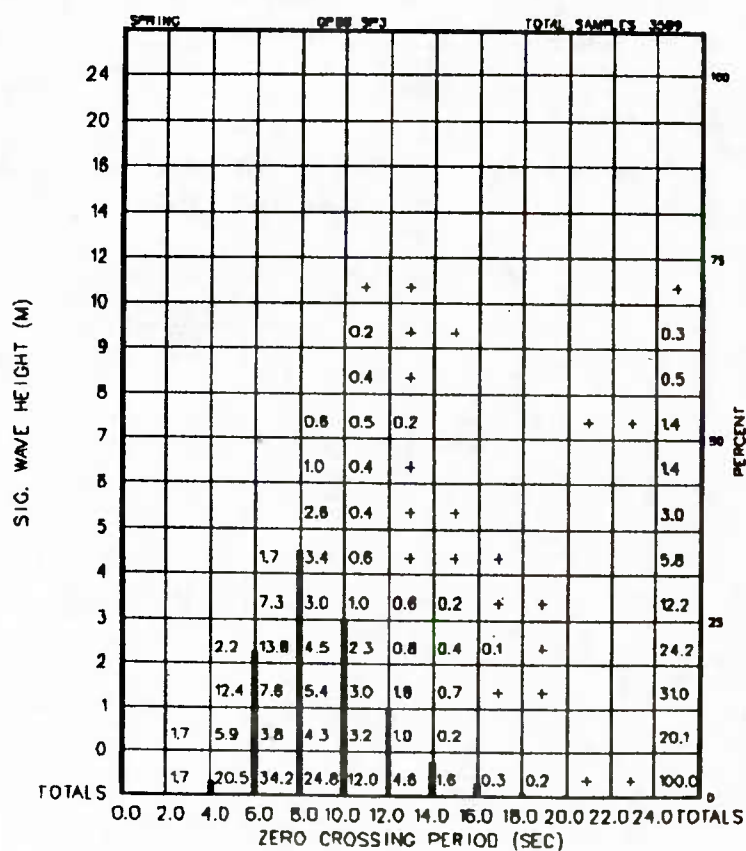


Figure A-088-3-6 Significant Wave Height vs. Zero Crossing Period

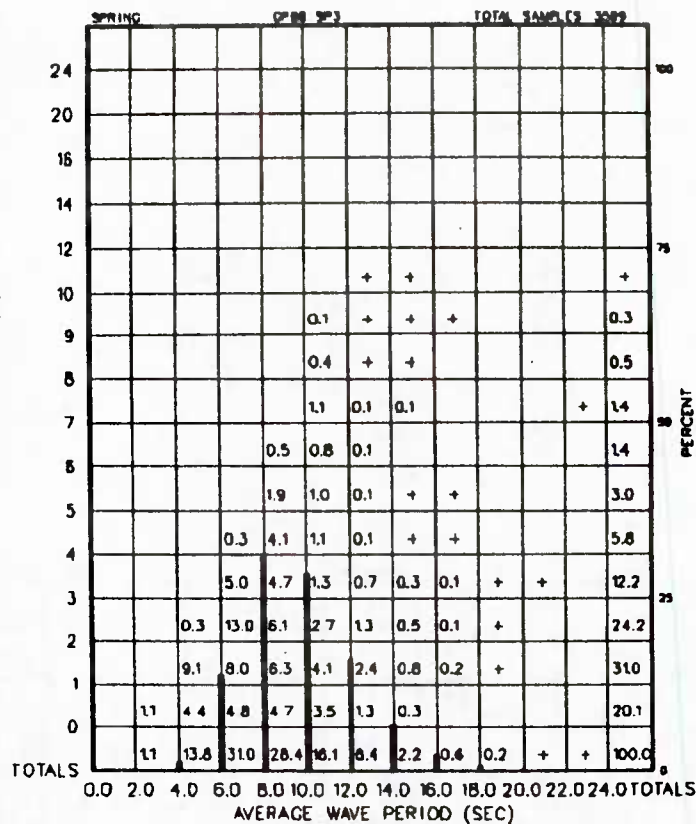


Figure A-088-3-7 Significant Wave Height vs. Average Wave Period

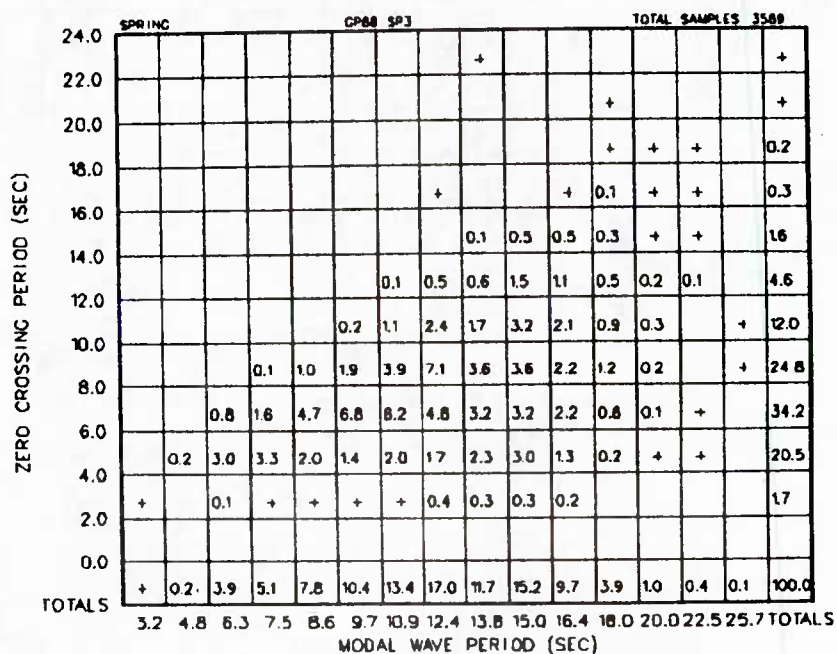


Figure A-088-3-8 Zero Crossing Period vs. Modal Wave Period



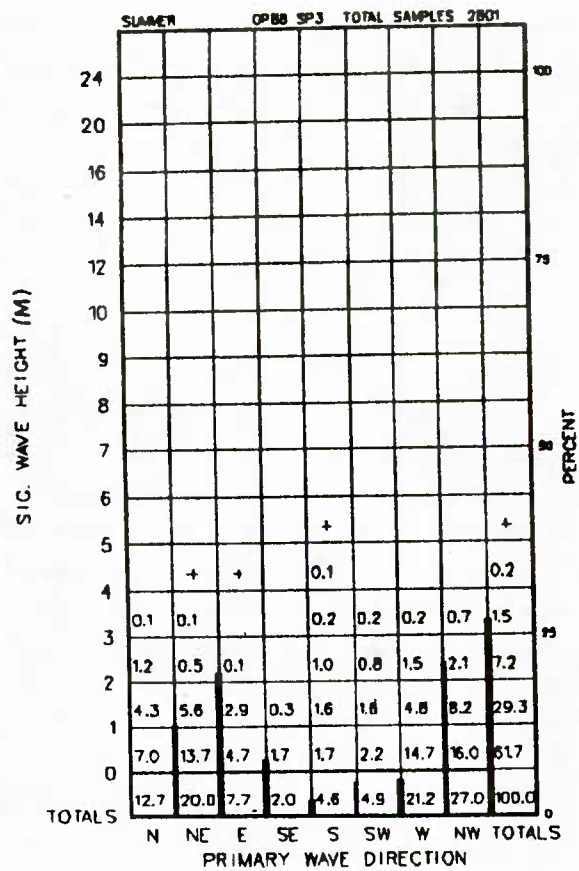


Figure A-088-4-3 Significant Wave Height vs. Primary Wave Direction

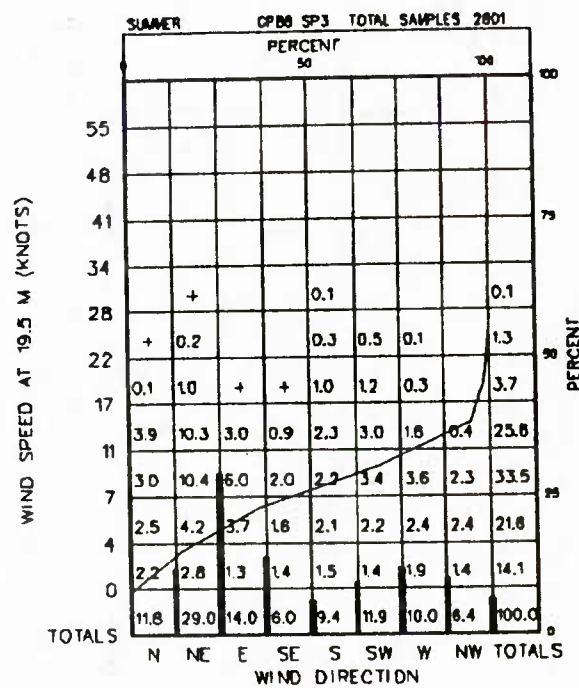


Figure A-088-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

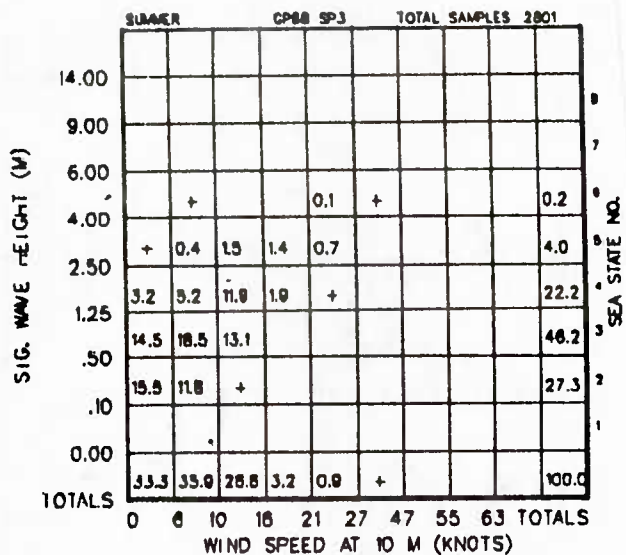


Figure A-088-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

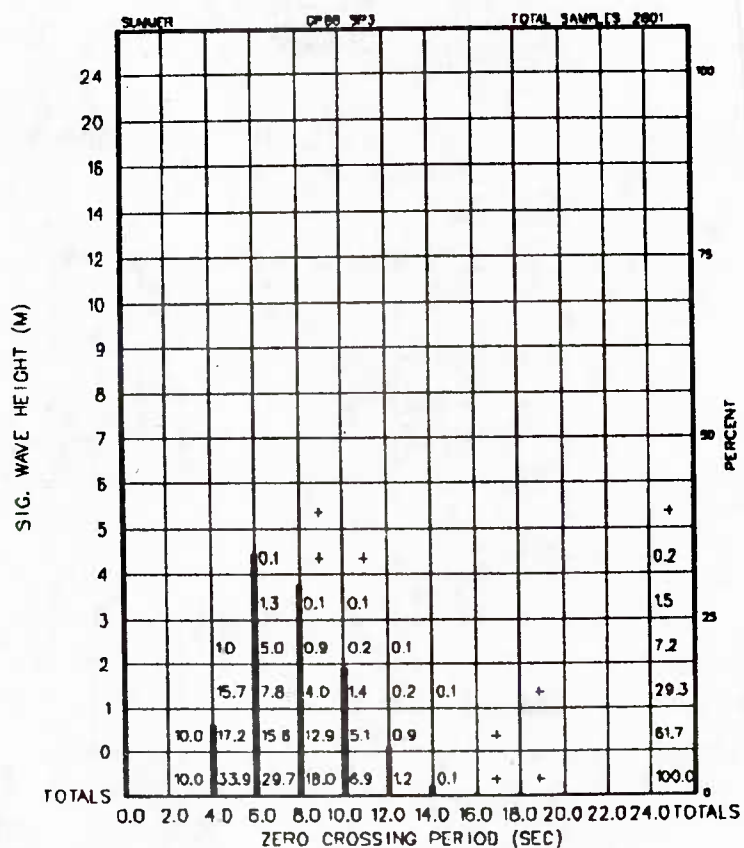


Figure A-088-4-6 Significant Wave Height vs. Zero Crossing Period

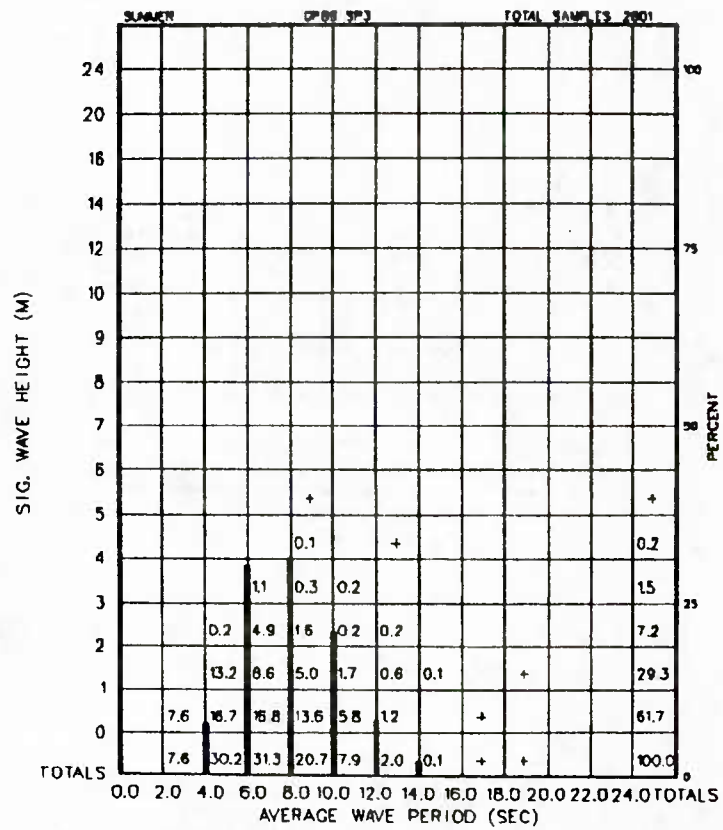


Figure A-088-4-7 Significant Wave Height vs. Average Wave Period

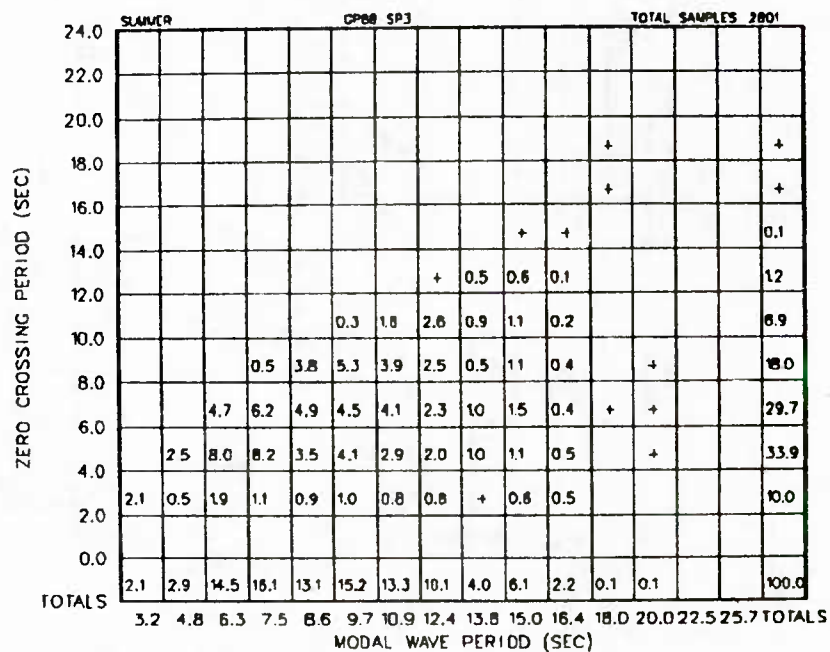


Figure A-088-4-8 Zero Crossing Period vs. Modal Wave Period

Figure A-088-4-9 Average Wave Period vs.
Modal Wave Period

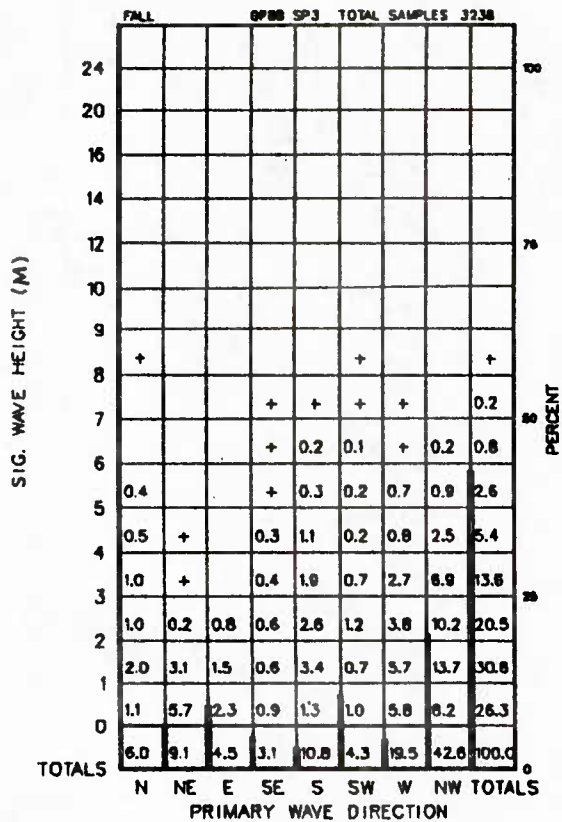


Figure A-088-5-3 Significant Wave Height vs. Primary Wave Direction

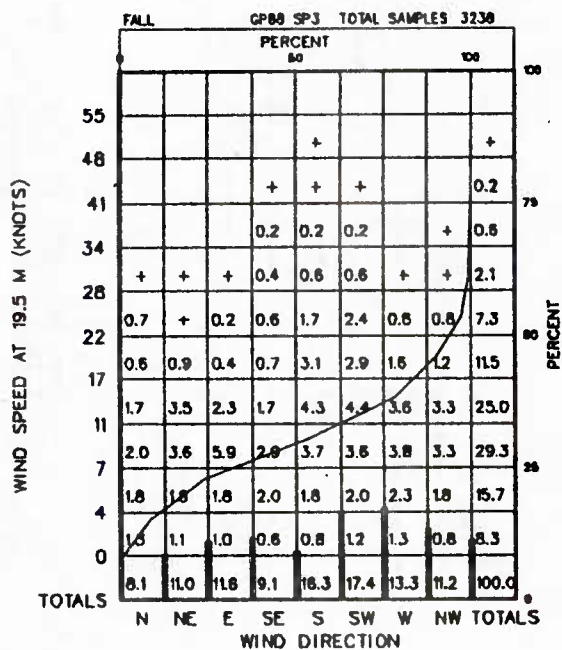


Figure A-088-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

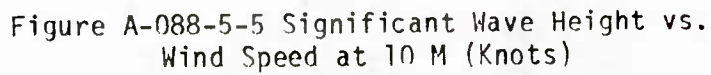




TABLE A-3/093-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 24.58°N, 135.65°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 10 -	3.5 19 -	1.75 11 -	1.5 9.7 NE
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 0.5 -	12 1.5 -	21 2.5 -	12 1.5 -	14 1.75 NE
Visibility, nautical miles	7	20	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1.5 0.5	6.5 5.5	8 7.5	- -	- -
Precipitation (Occurrence)	All precipitation - 3% of the time				
Relative Humidity, %	60	75	92	-	-
Air Temperature, °C	19	21	24	21.5	-
Sea Surface Temperature, °C	22	24	26	-	-
Sea Level Pressure, millibars	1014	1017	1021	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	343 - -	- 2% 3%

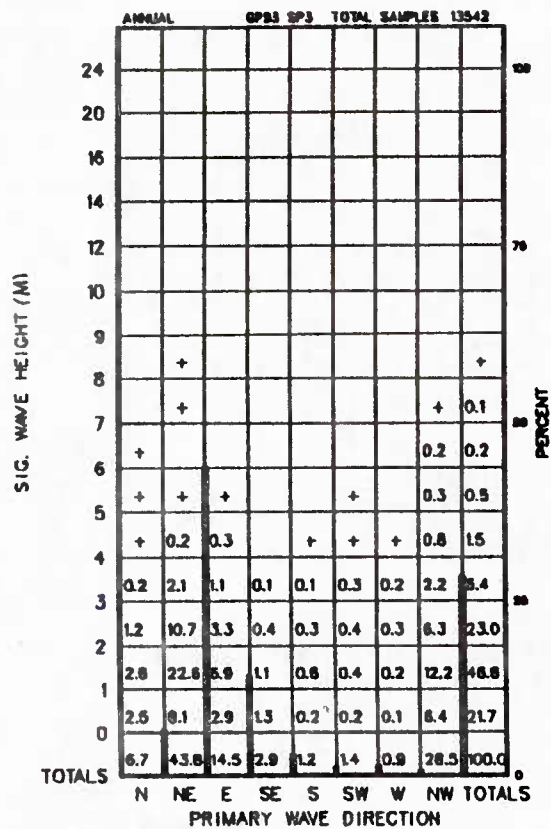


Figure A-3/093-1-3 Significant Wave Height vs. Primary Wave Direction

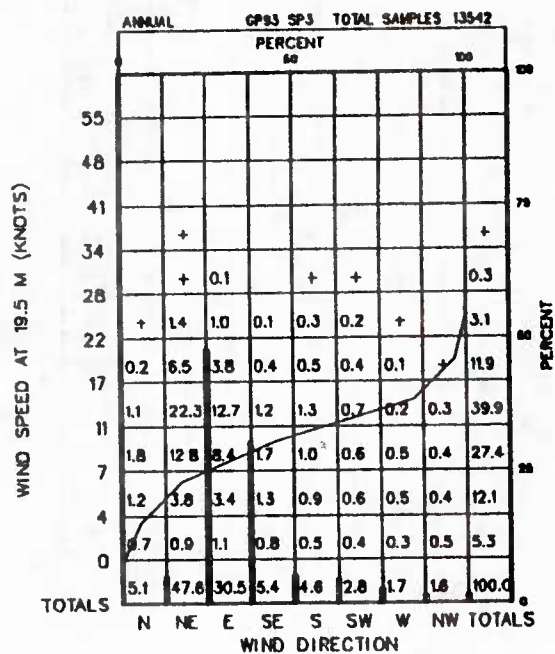


Figure A-3/093-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

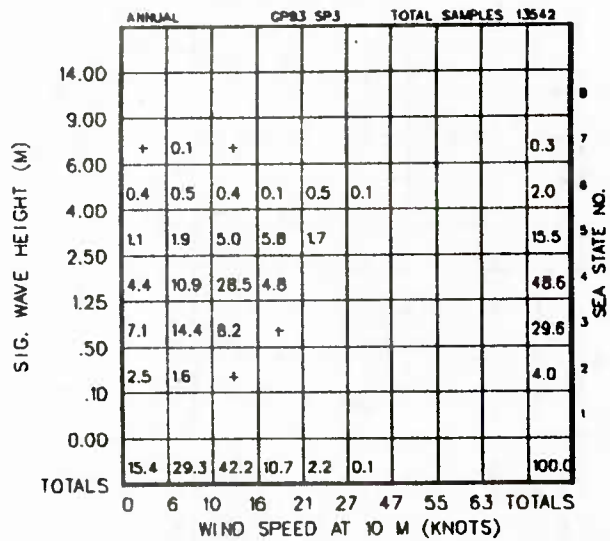


Figure A-3/093-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

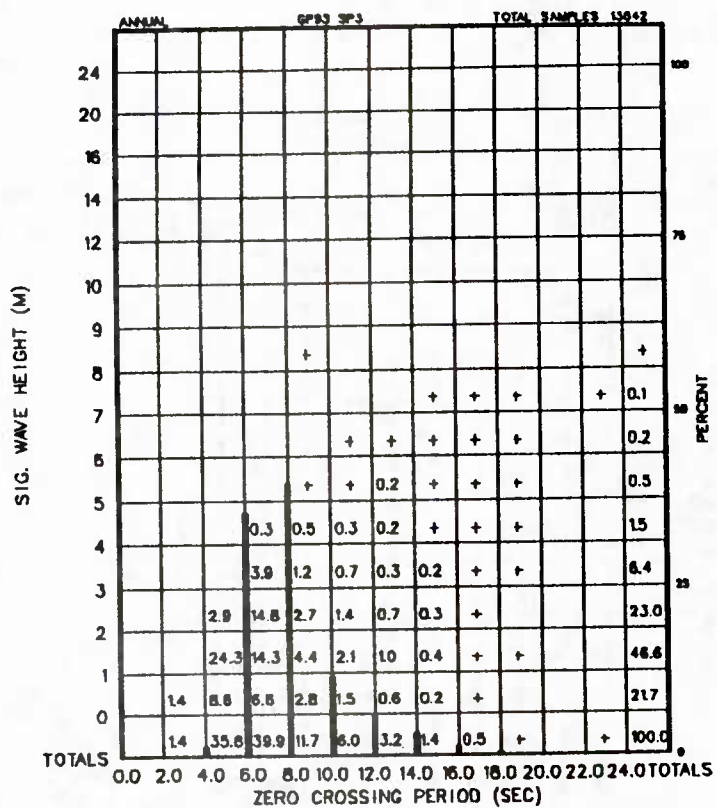


Figure A-3/093-1-6 Significant Wave Height vs. Zero Crossing Period

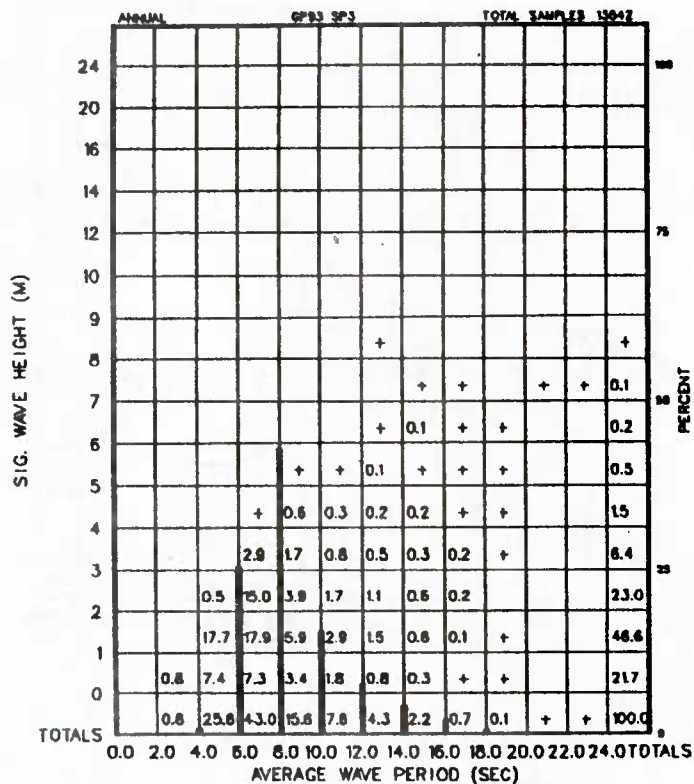


Figure A-3/093-1-7 Significant Wave Height vs. Average Wave Period

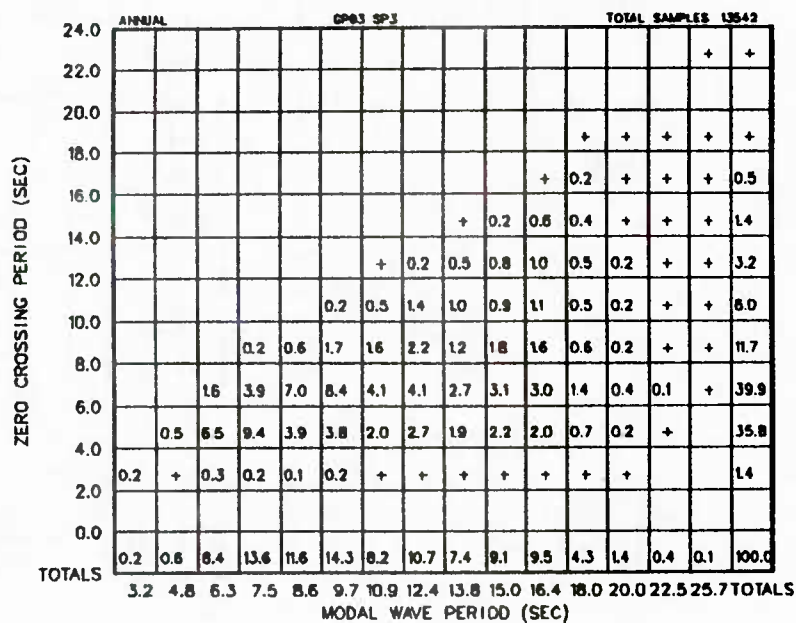


Figure A-3/093-1-8 Zero Crossing Period vs. Modal Wave Period

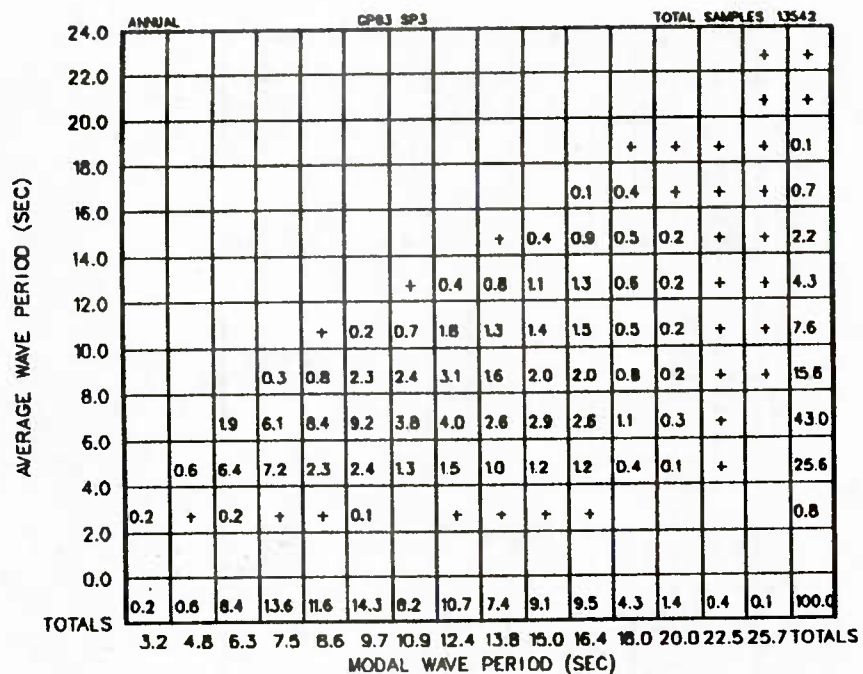


Figure A-3/093-1-9 Average Wave Period vs. Modal Wave Period

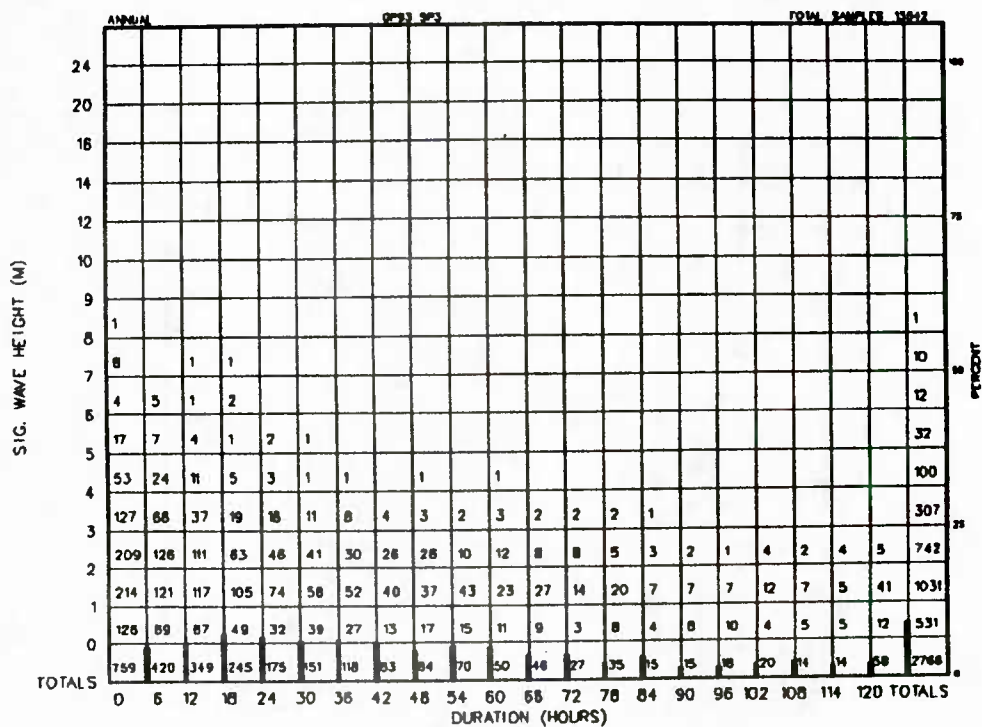
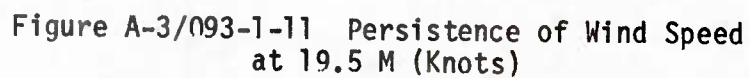


Figure A-3/093-1-10 Persistence of Wave Height



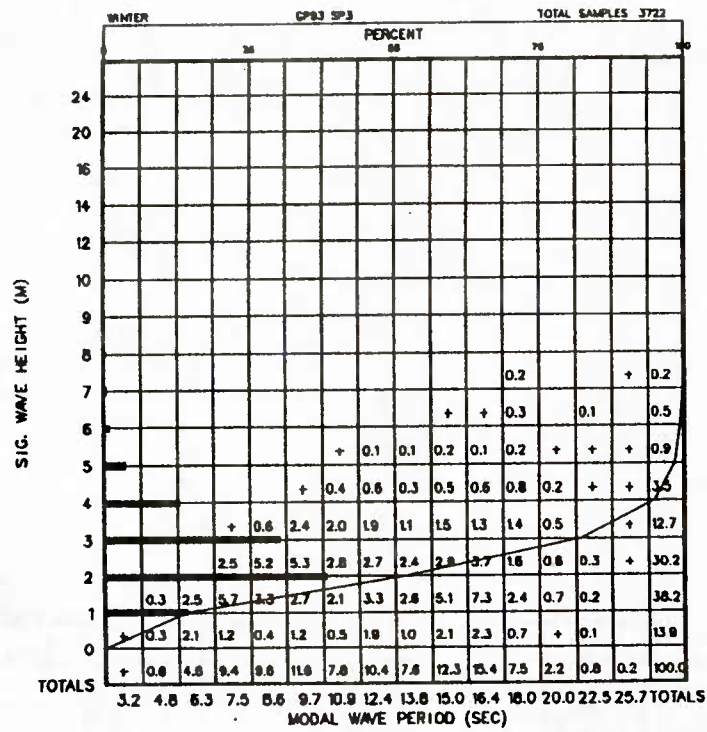


Figure A-3/093-2-1 Significant Wave Height vs. Modal Wave Period

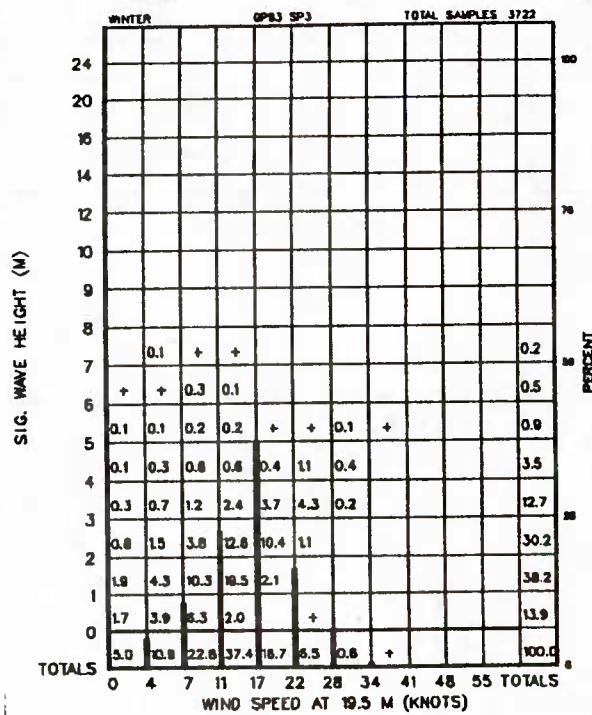


Figure A-3/093-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

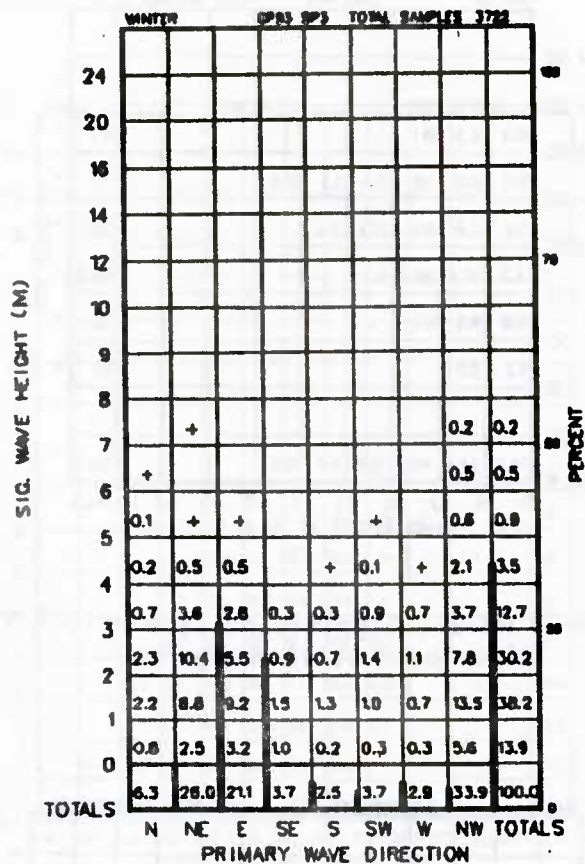


Figure A-3/093-2-3 Significant Wave Height vs. Primary Wave Direction

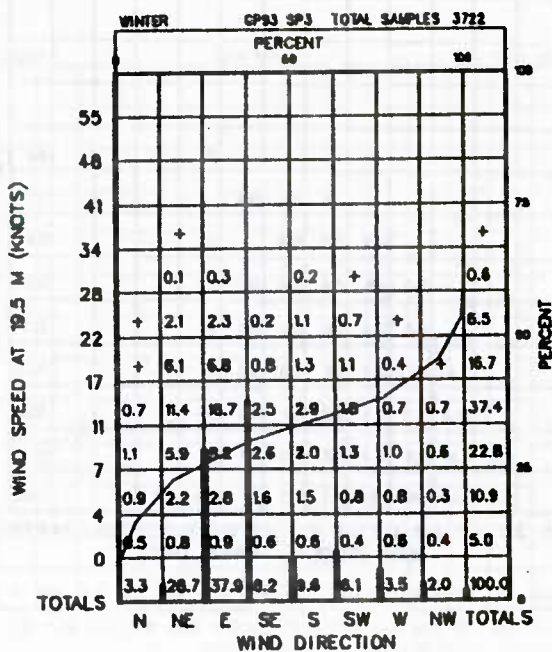
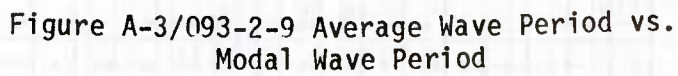


Figure A-3/093-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



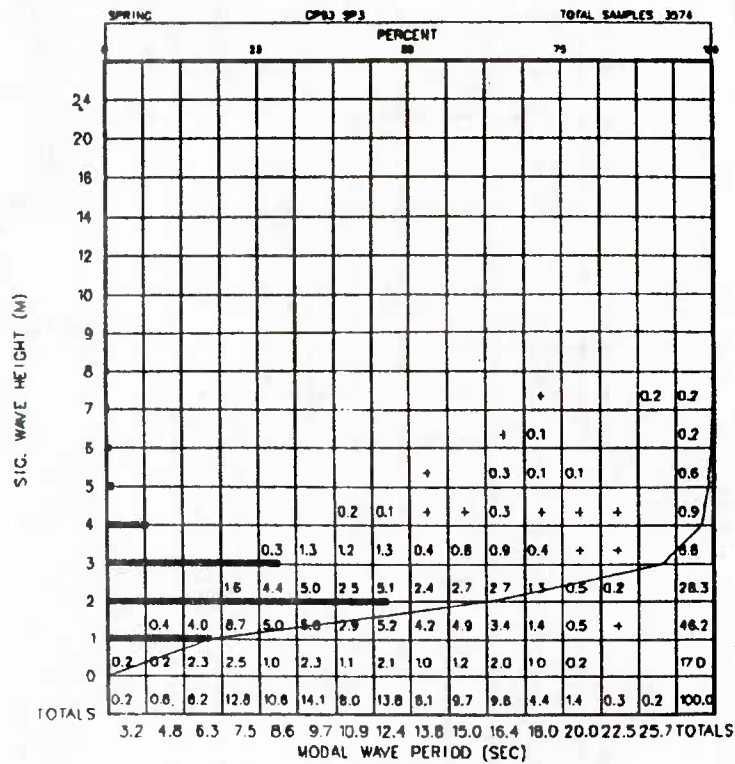


Figure A-3/093-3-1 Significant Wave Height vs. Modal Wave Period

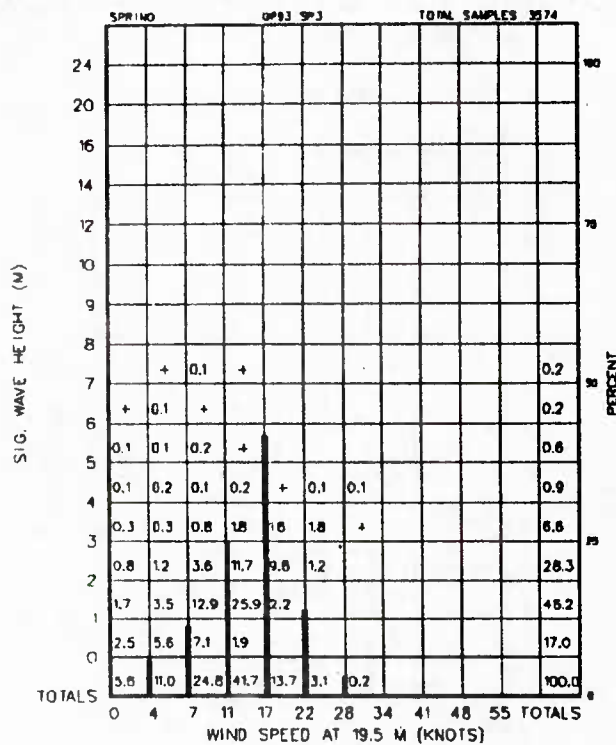


Figure A-3/093-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

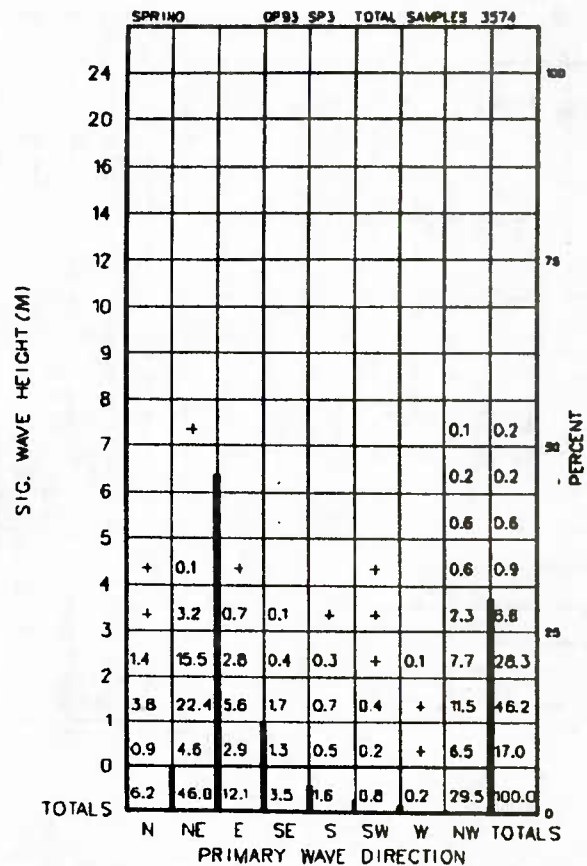


Figure A-3/093-3-3 Significant Wave Height vs. Primary Wave Direction

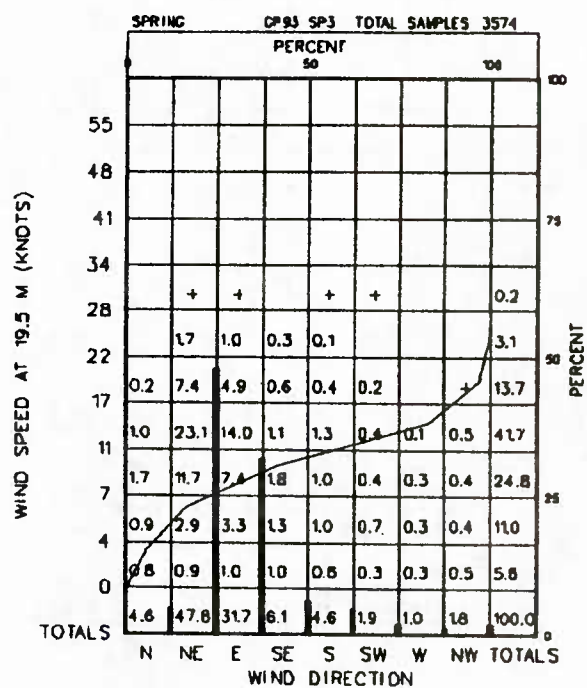


Figure A-3/093-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

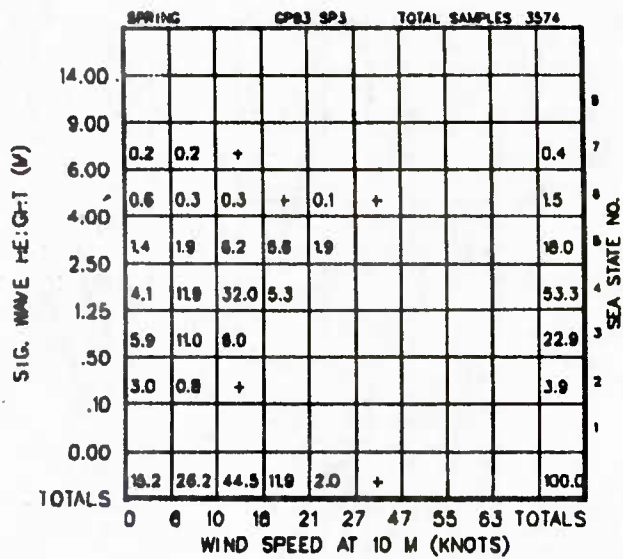


Figure A-3/093-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

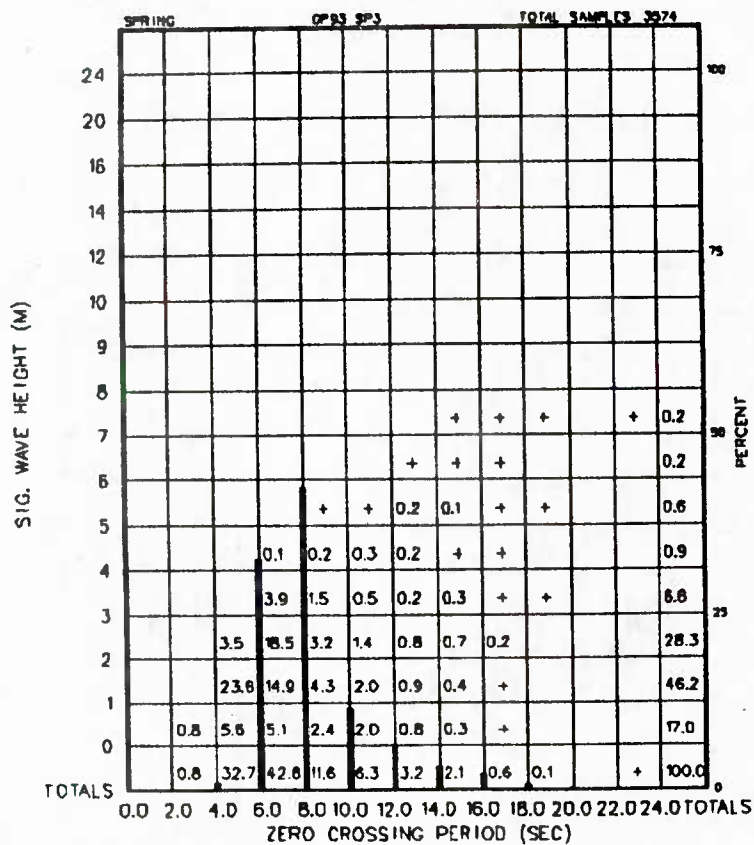


Figure A-3/093-3-6 Significant Wave Height vs. Zero Crossing Period

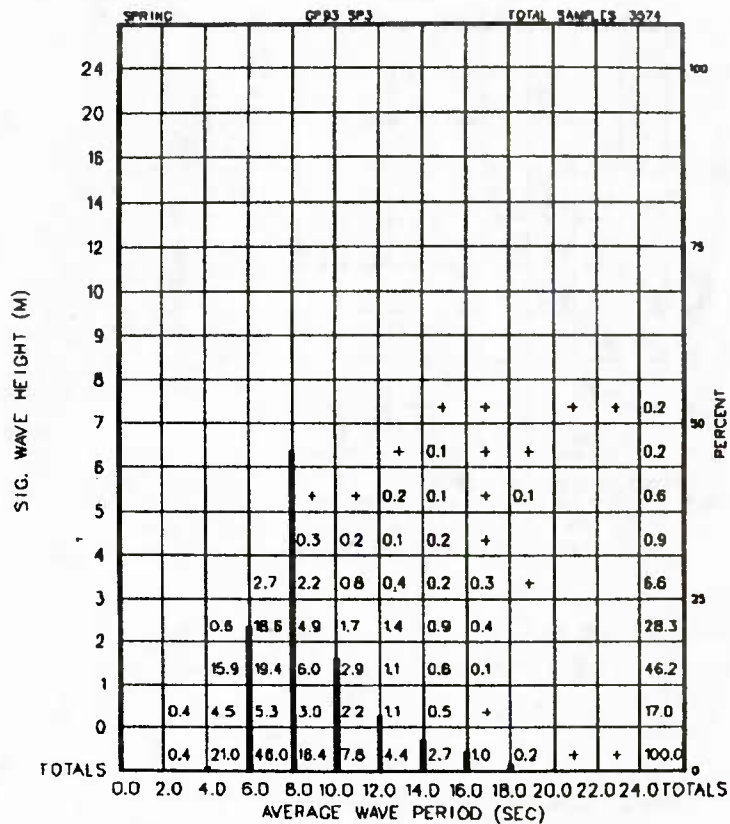


Figure A-3/093-3-7 Significant Wave Height vs. Average Wave Period

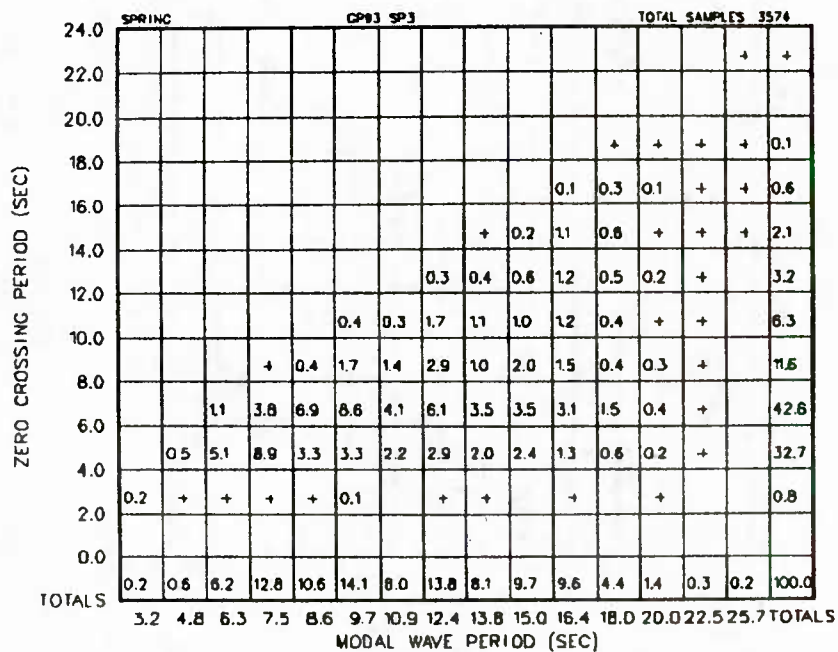


Figure A-3/093-3-8 Zero Crossing Period vs. Modal Wave Period

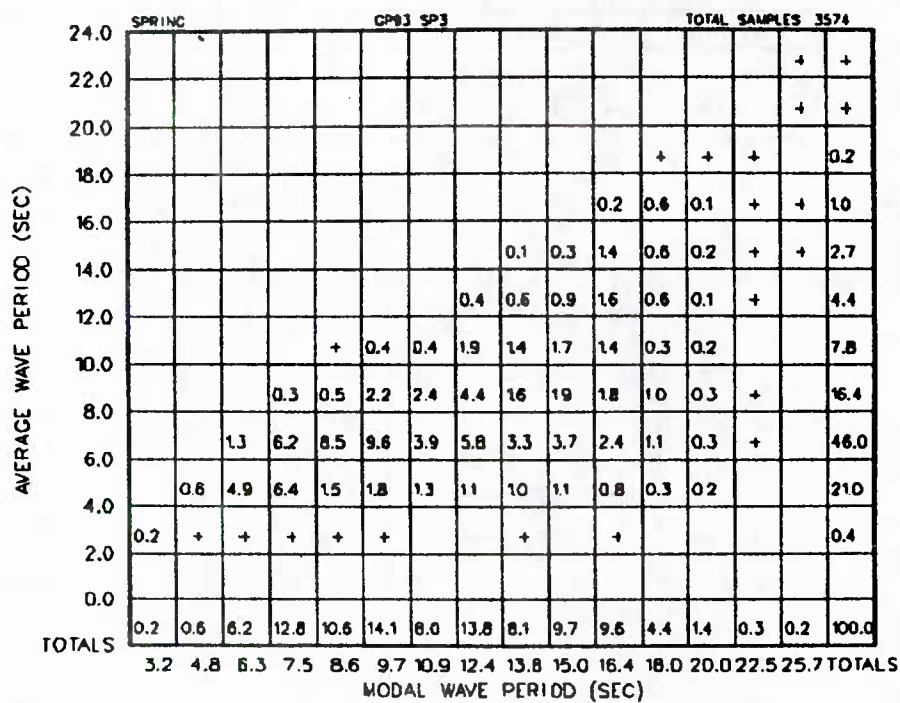


Figure A-3/093-3-9 Average Wave Period vs.
Modal Wave Period

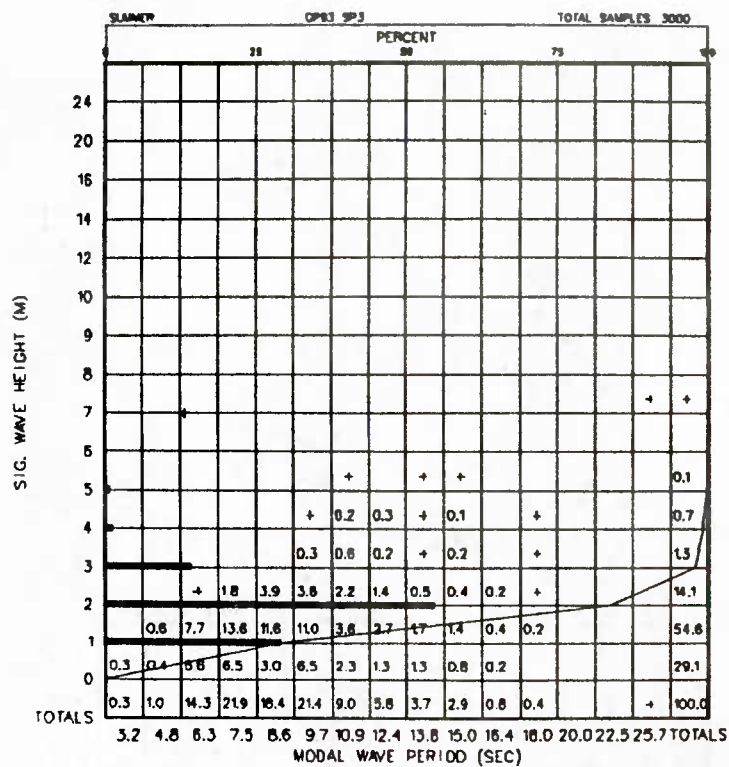


Figure A-3/093-4-1 Significant Wave Height vs. Modal Wave Period

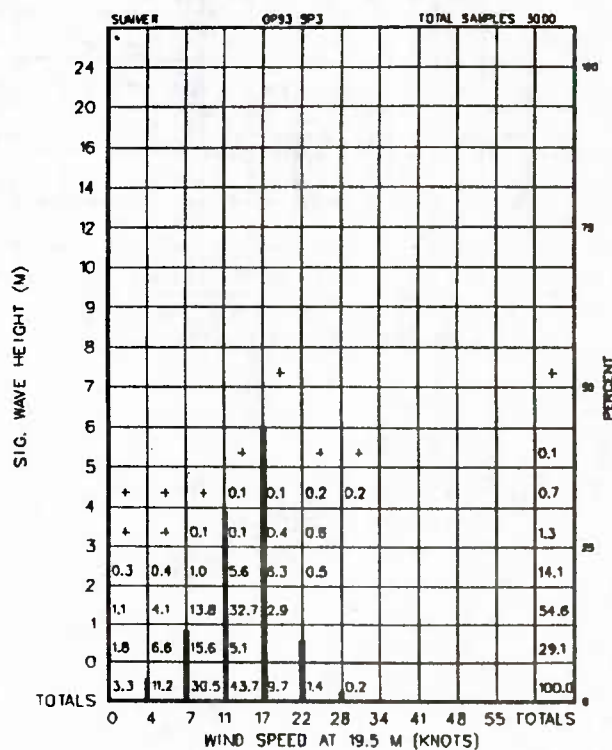


Figure A-3/093-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

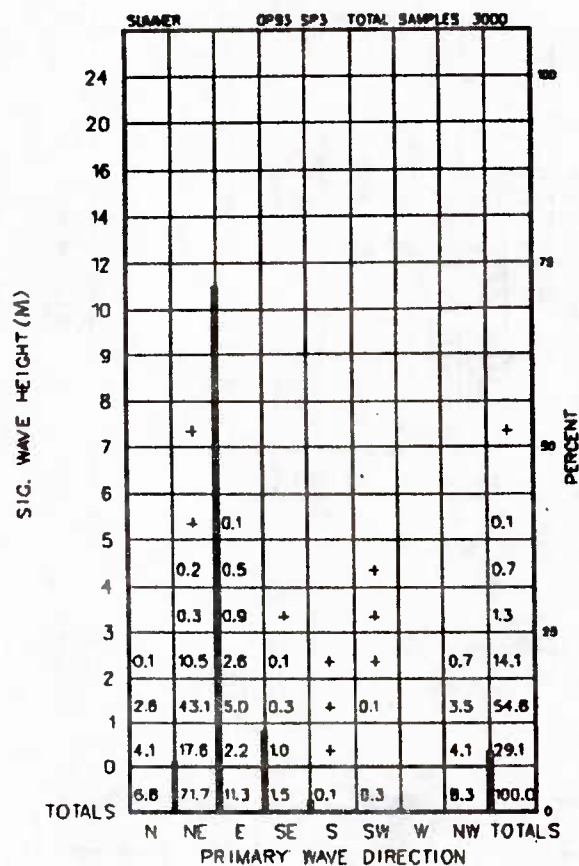


Figure A-3/093-4-3 Significant Wave Height vs. Primary Wave Direction

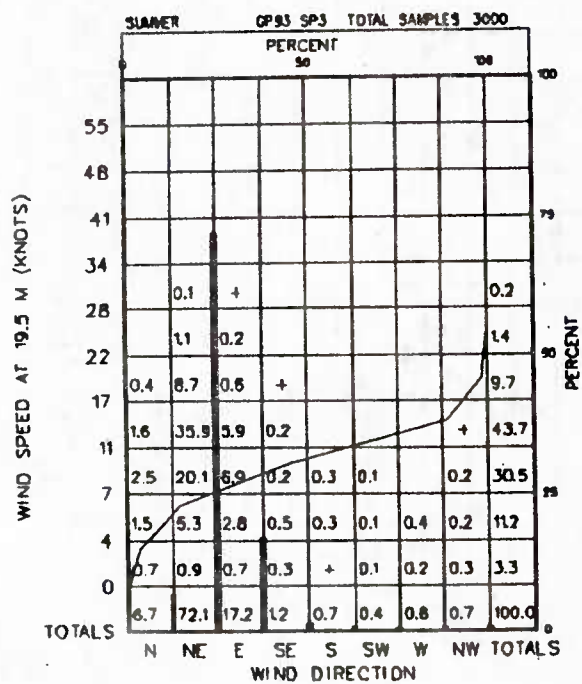


Figure A-3/093-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

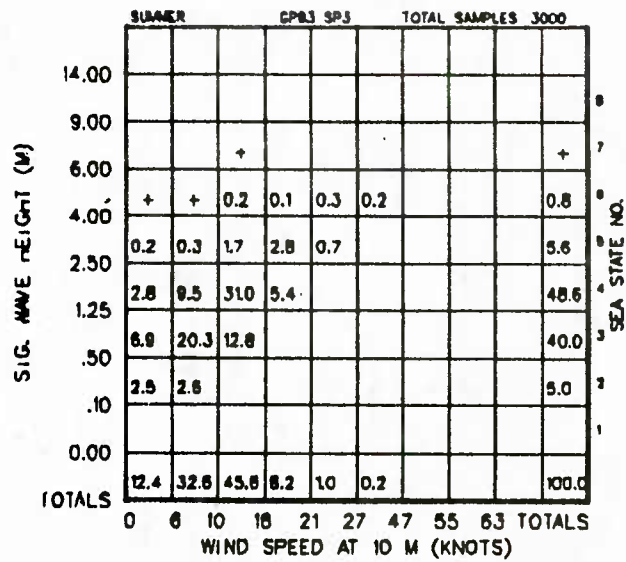


Figure A-3/093-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

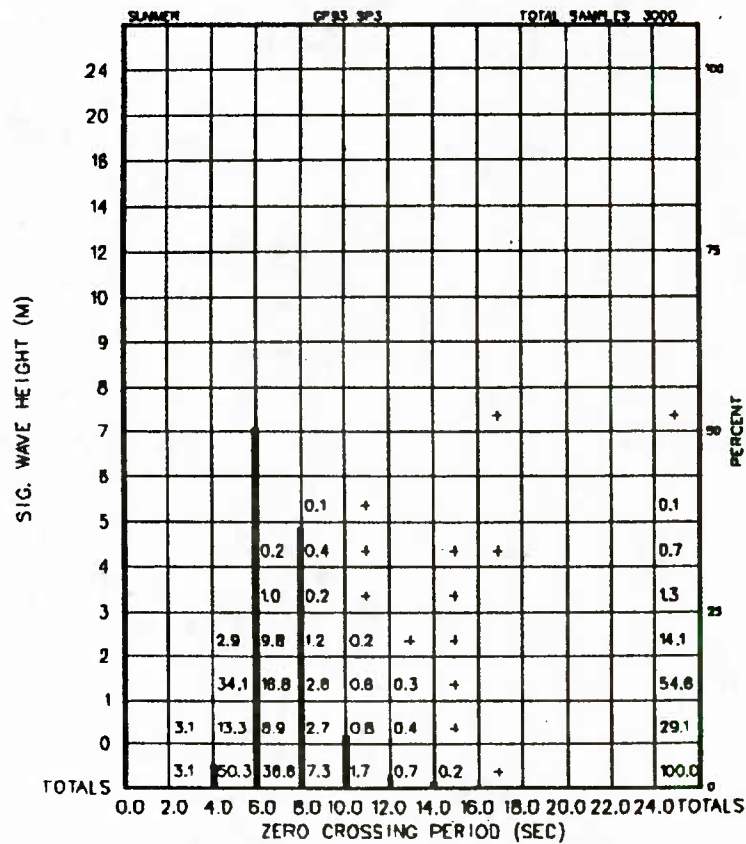


Figure A-3/093-4-6 Significant Wave Height vs. Zero Crossing Period

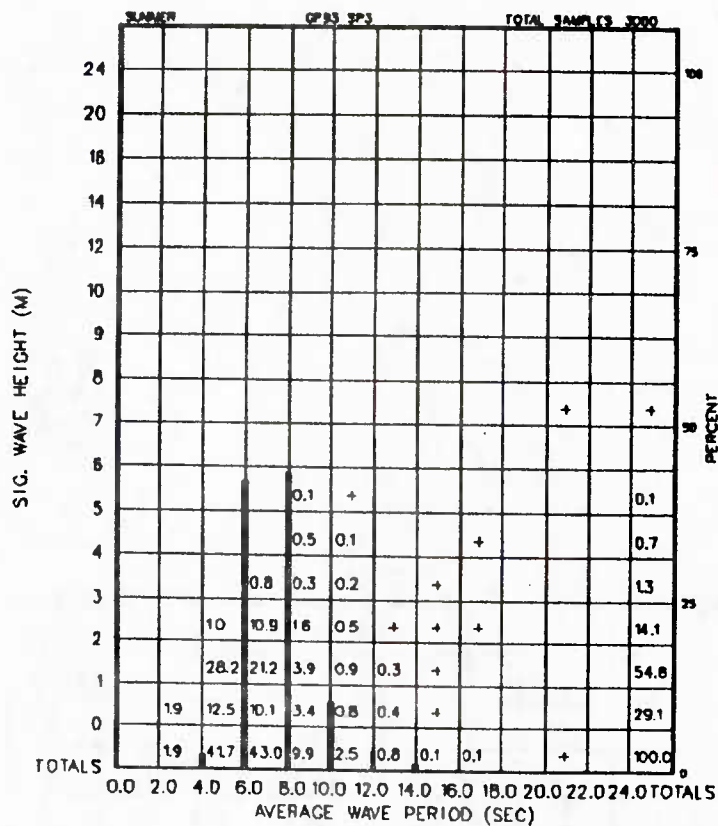


Figure A-3/093-4-7 Significant Wave Height vs. Average Wave Period

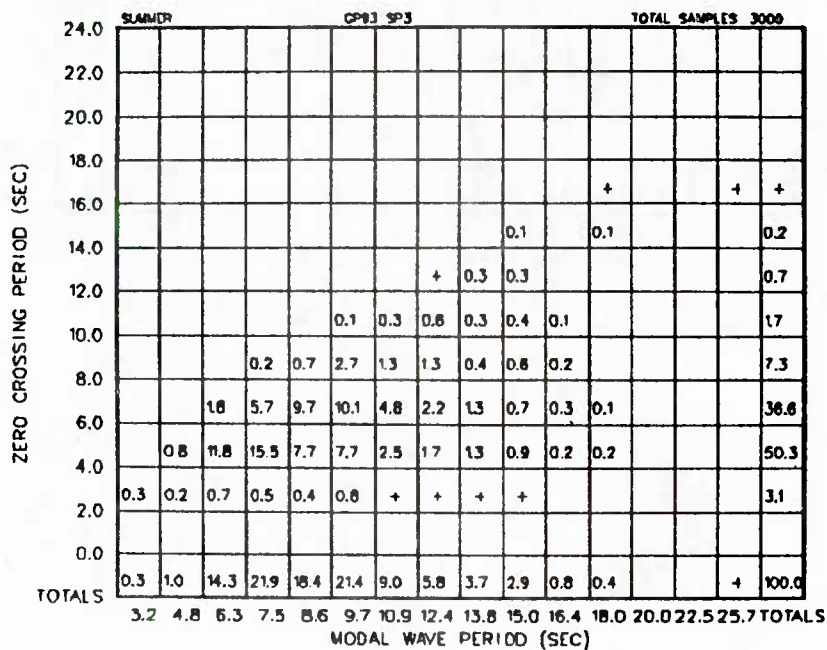


Figure A-3/093-4-8 Zero Crossing Period vs. Modal Wave Period

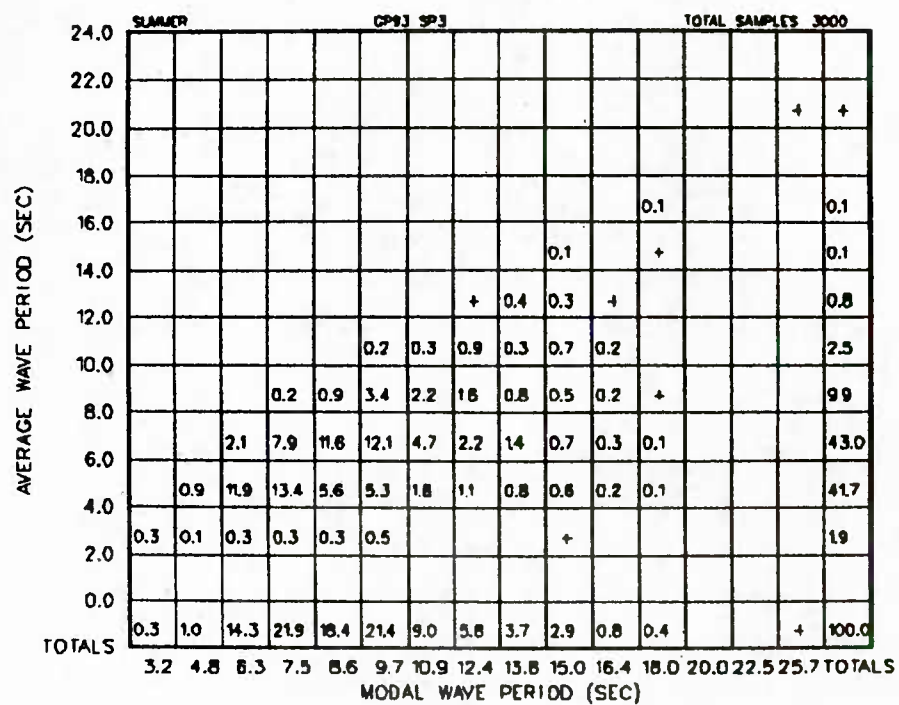


Figure A-3/093-4-9 Average Wave Period vs.
Modal Wave Period

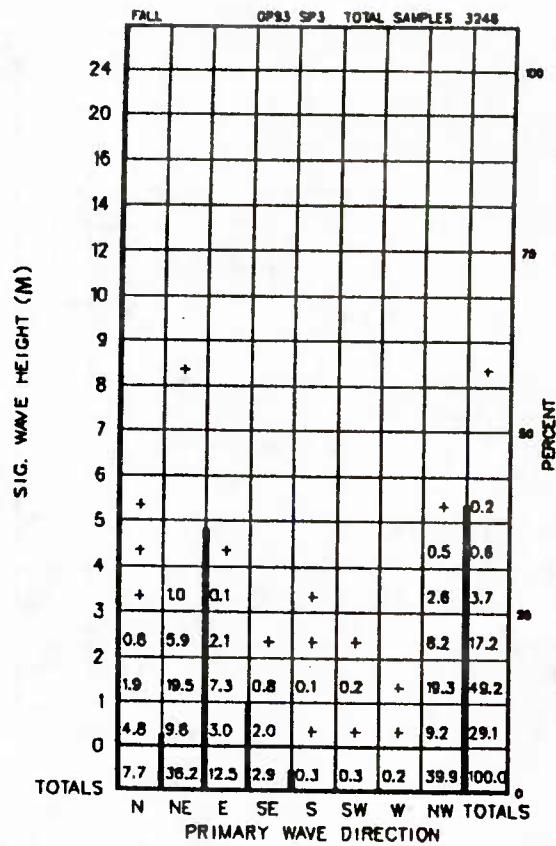


Figure A-3/093-5-3 Significant Wave Height vs. Primary Wave Direction

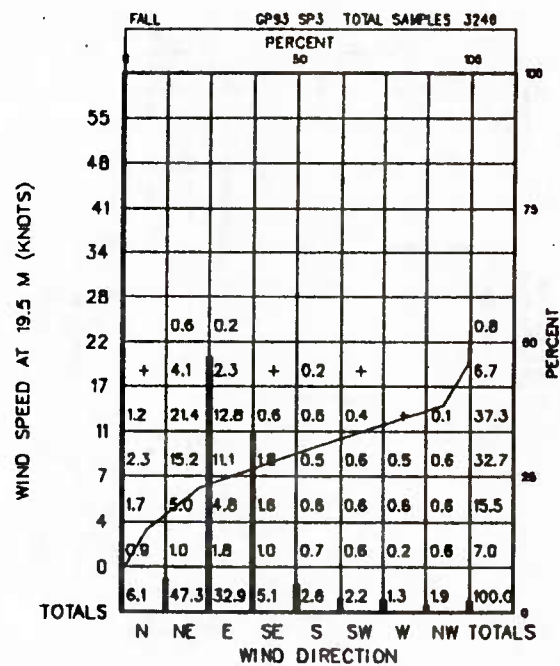


Figure A-3/093-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

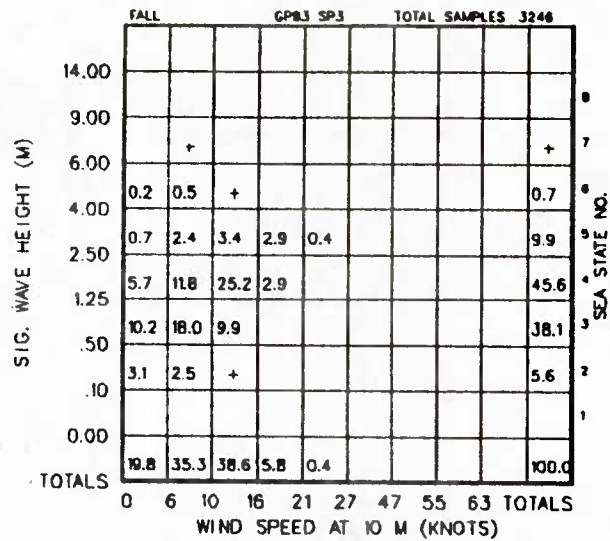


Figure A-3/093-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

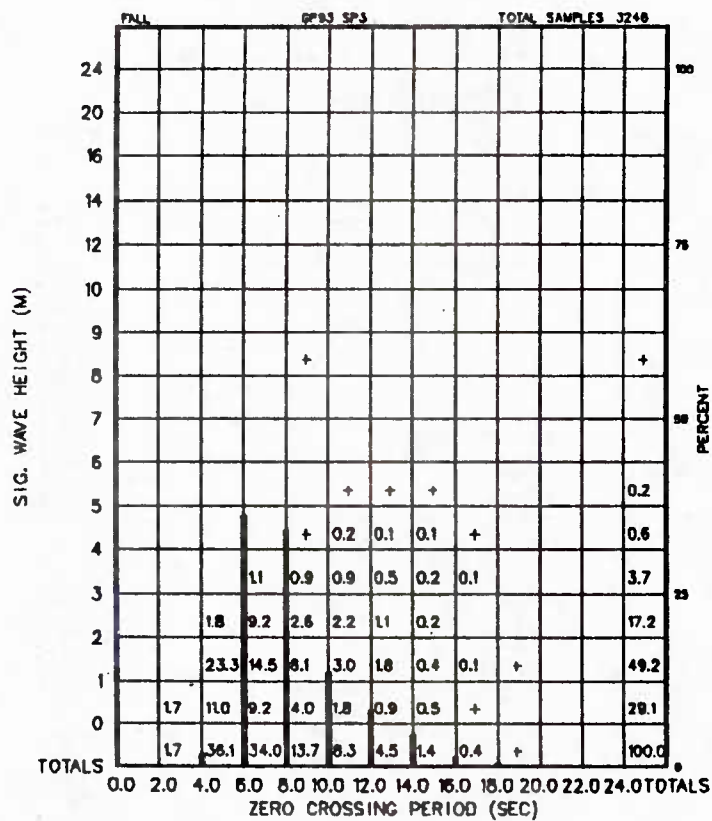


Figure A-3/093-5-6 Significant Wave Height vs. Zero Crossing Period

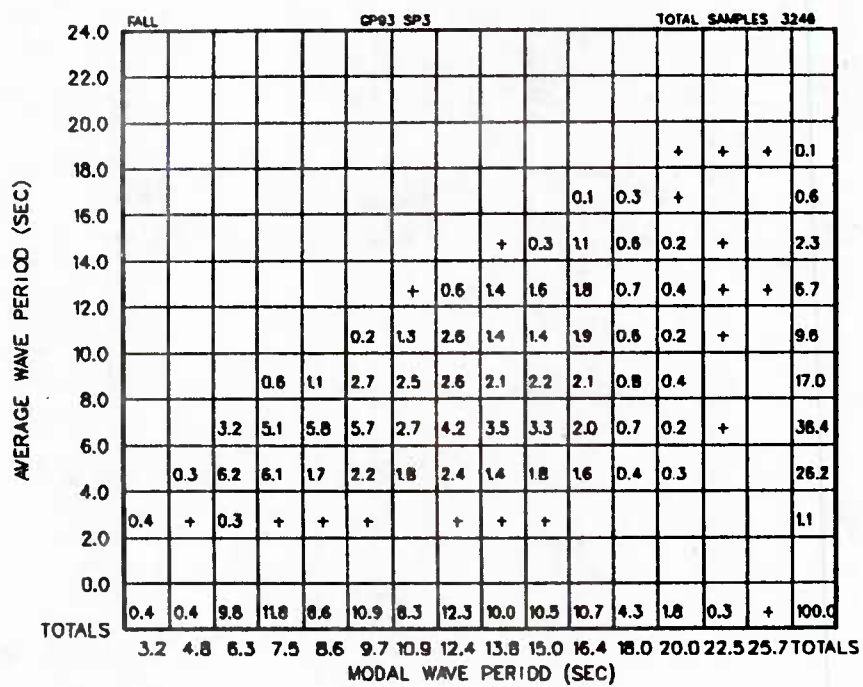


Figure A-3/093-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-3/121-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 56.38°N, 171.71°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6.5 -	2.5 11 -	7.5 17.5 -	3 11.5 -	1.5 12.4 SW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4.5 0.75 -	15 2 -	37 6.75 -	17 2.5 -	14 2 E-NE
Visibility, nautical miles	0.5	7	22	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7.5 7	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 38% of the time		Snow - 20% of the time (Dec-Mar)		
Relative Humidity, %	70	89	99	-	-
Air Temperature, °C	-3	1.5	5	1.5	-
Sea Surface Temperature, °C	2.5	4	5.5	-	-
Sea Level Pressure, millibars	990	1010	1030	-	-
Ice	Moderate superstructure icing -1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	316 - -	- 24 14

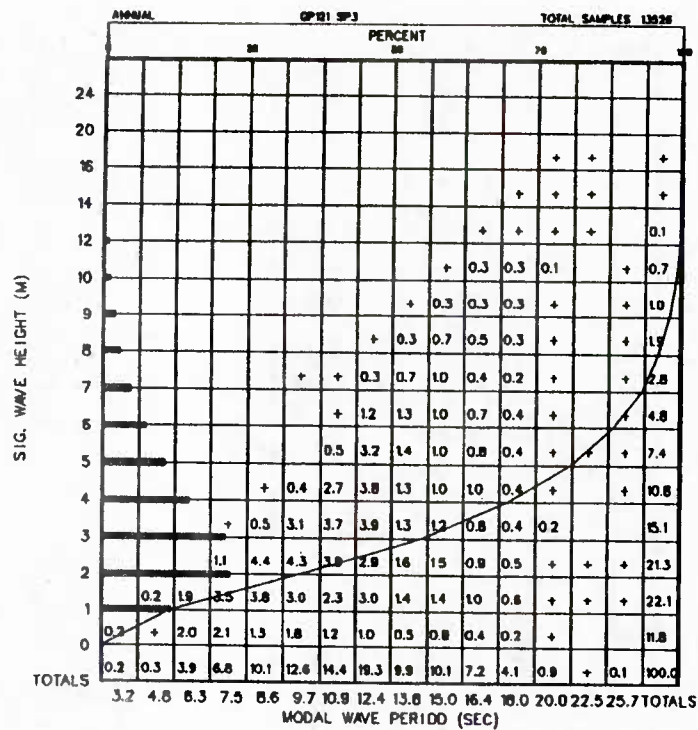


Figure A-3/121-1-1 Significant Wave Height vs. Modal Wave Period

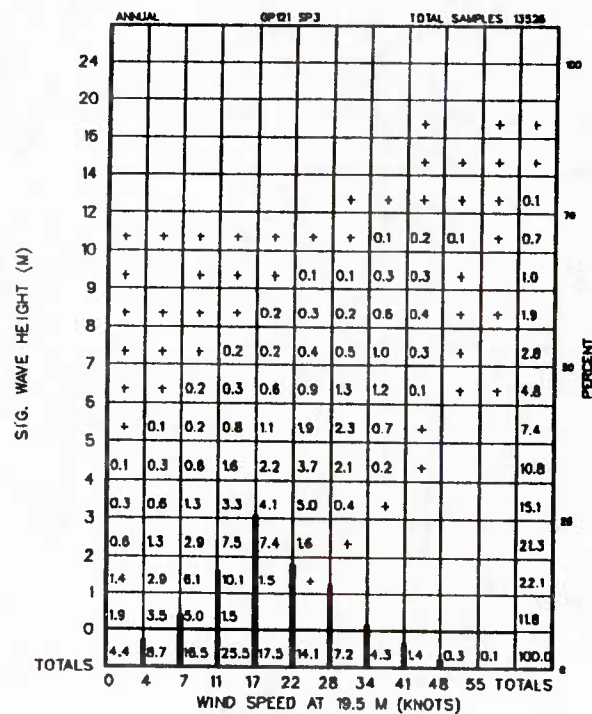


Figure A-3/121-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

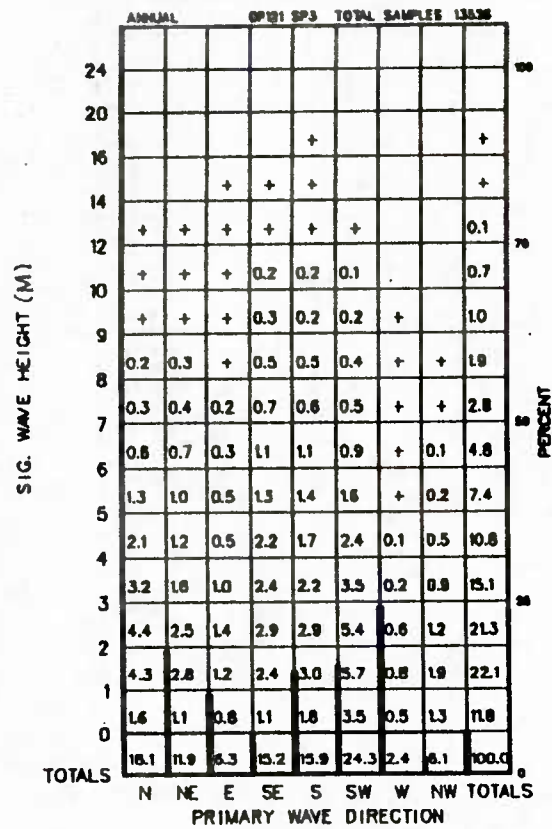


Figure A-3/121-1-3 Significant Wave Height vs. Primary Wave Direction

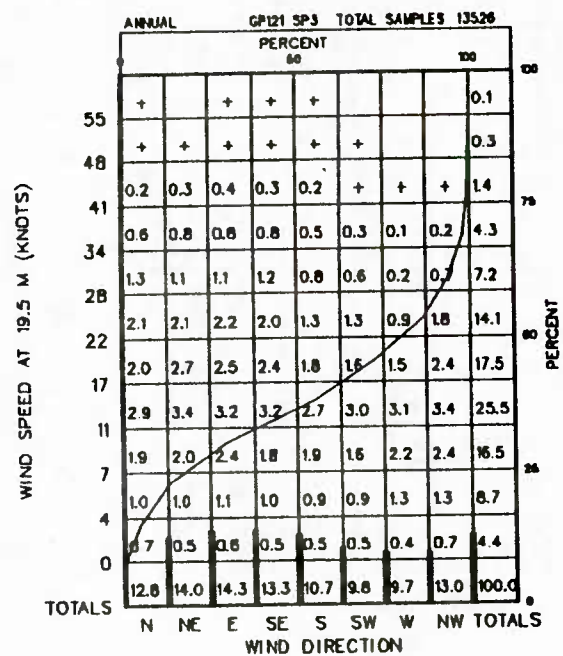


Figure A-3/121-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

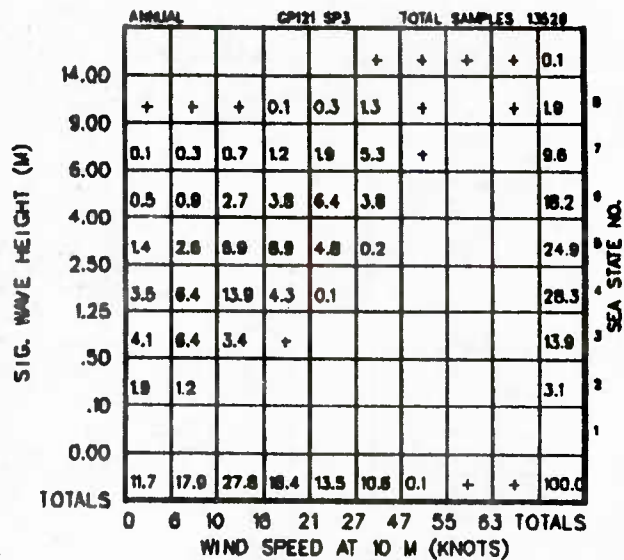


Figure A-3/121-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

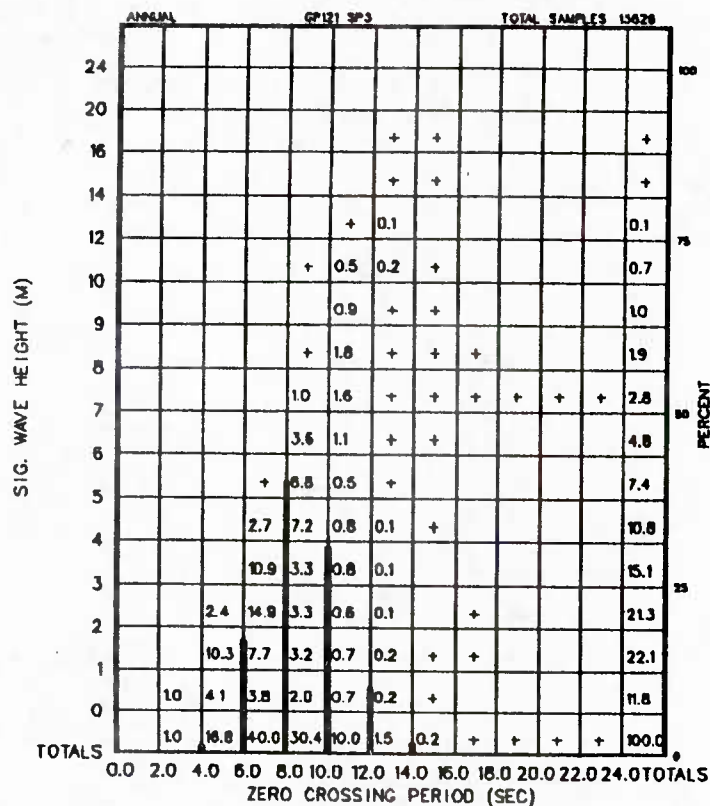


Figure A-3/121-1-6 Significant Wave Height vs. Zero Crossing Period

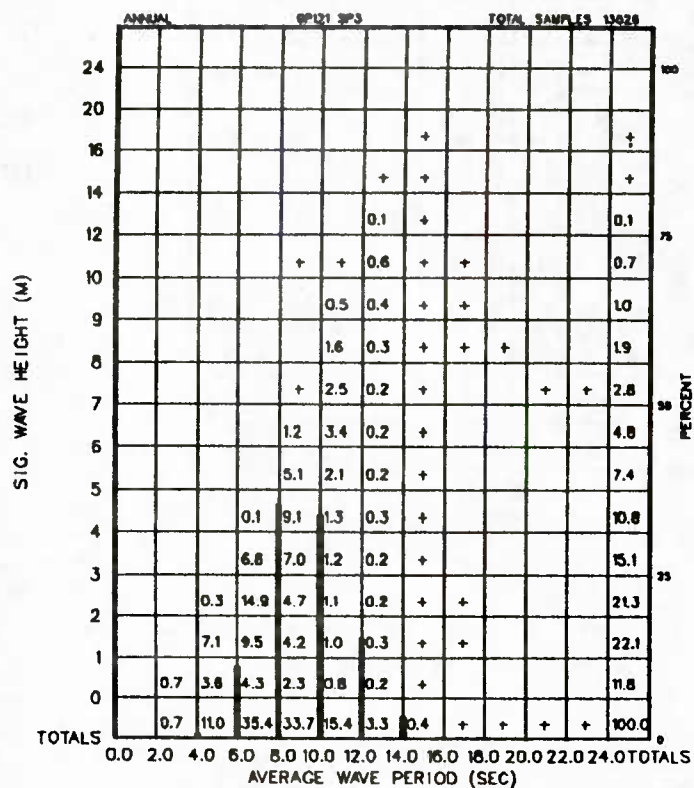


Figure A-3/121-1-7 Significant Wave Height vs. Average Wave Period

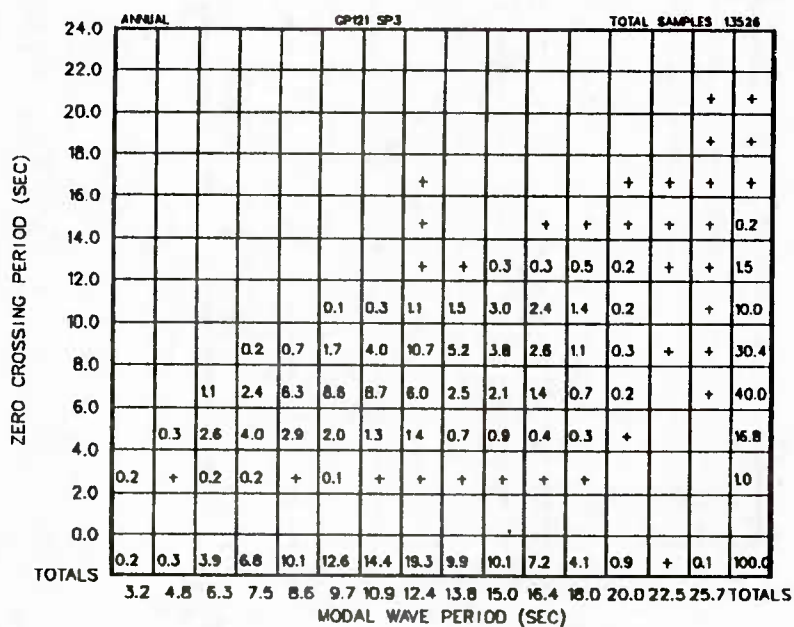


Figure A-3/121-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		04121 SP 3																TOTAL SAMPLES 13228					
WIND SPEED AT 19.5 M (KNOTS)	55	3	3	1	1															8			
	48	21	8	2	1															32			
	41	84	25	11	6	1														127			
	34	189	92	27	13	8	3	1		1		1								333			
	28	376	126	52	20	14	3	3												594			
	22	561	227	111	54	25	11	10	4	2				2						1007			
	17	783	280	143	53	38	15	9	3	2				1						1307			
	11	778	375	193	101	44	43	17	15	8	8	2	2	1	1	1				1587			
	7	713	281	108	59	29	20	6	5	3	2	2	1							1210			
	4	465	160	51	34	11	3	1	2			1								728			
	0	201	70	40	12	7	3	2	1			1								337			
TOTALS	4154	1527	740	354	175	101	49	30	18	8	7	3	4	1	1				7270				
		DURATION (HOURS)																TOTALS					
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-3/121-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

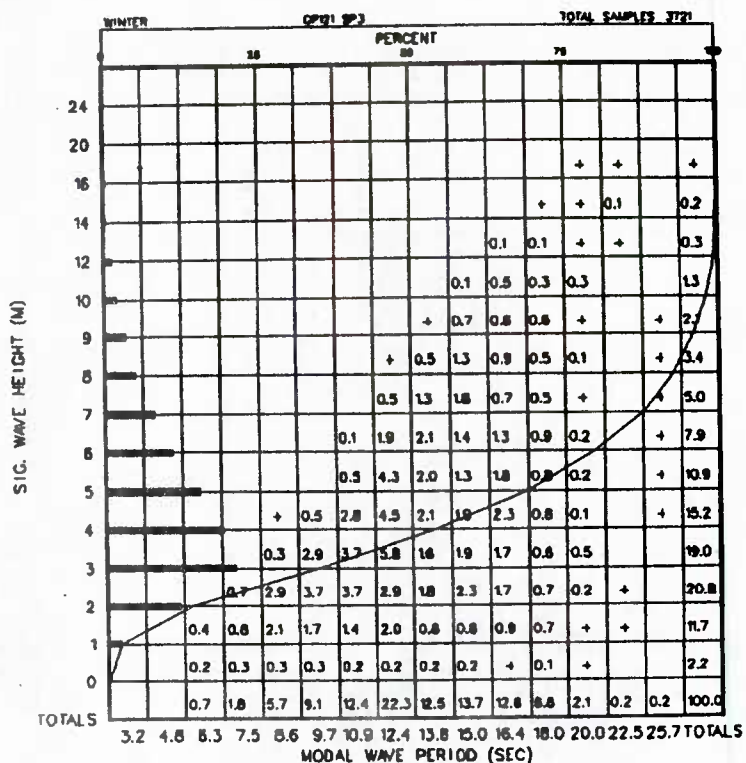


Figure A-3/121-2-1 Significant Wave Height vs. Modal Wave Period

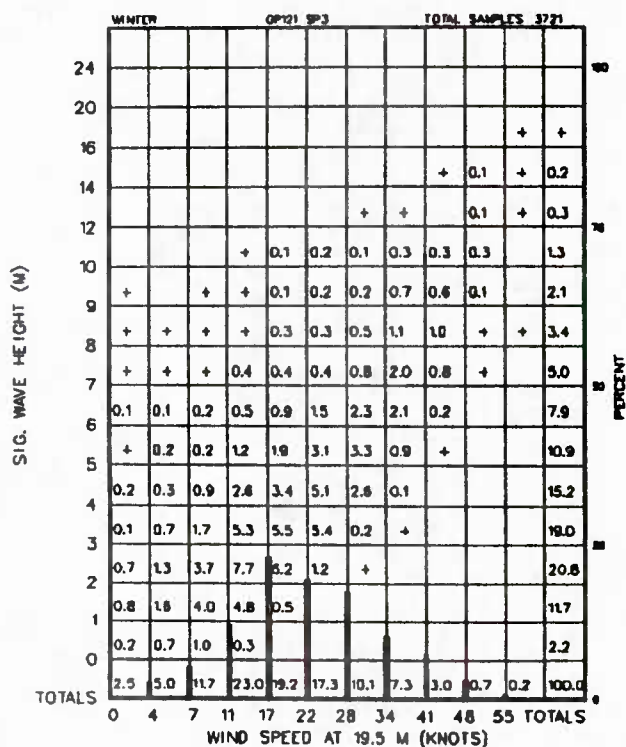


Figure A-3/121-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

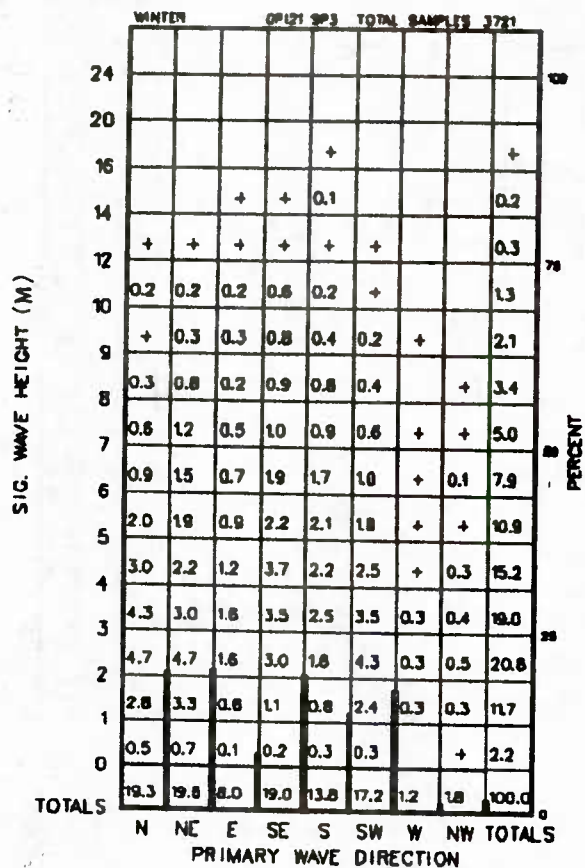


Figure A-3/121-2-3 Significant Wave Height vs. Primary Wave Direction

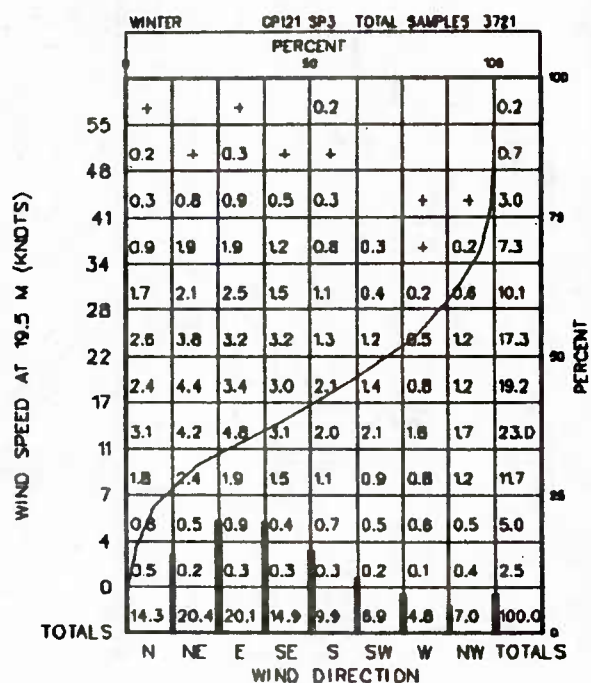


Figure A-3/121-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

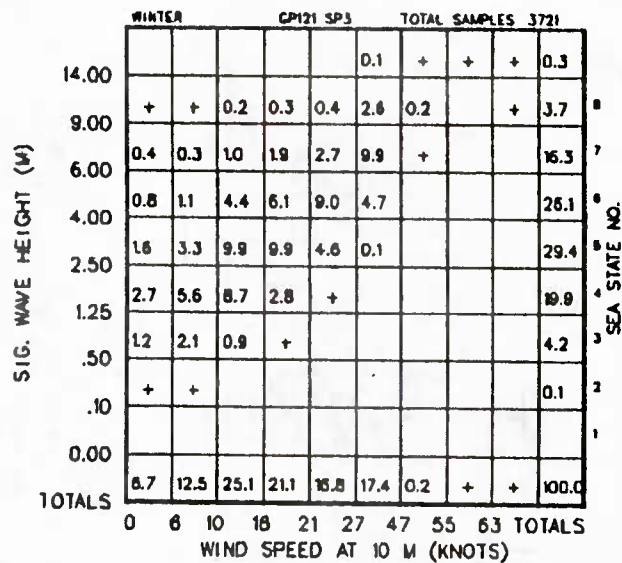


Figure A-3/121-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

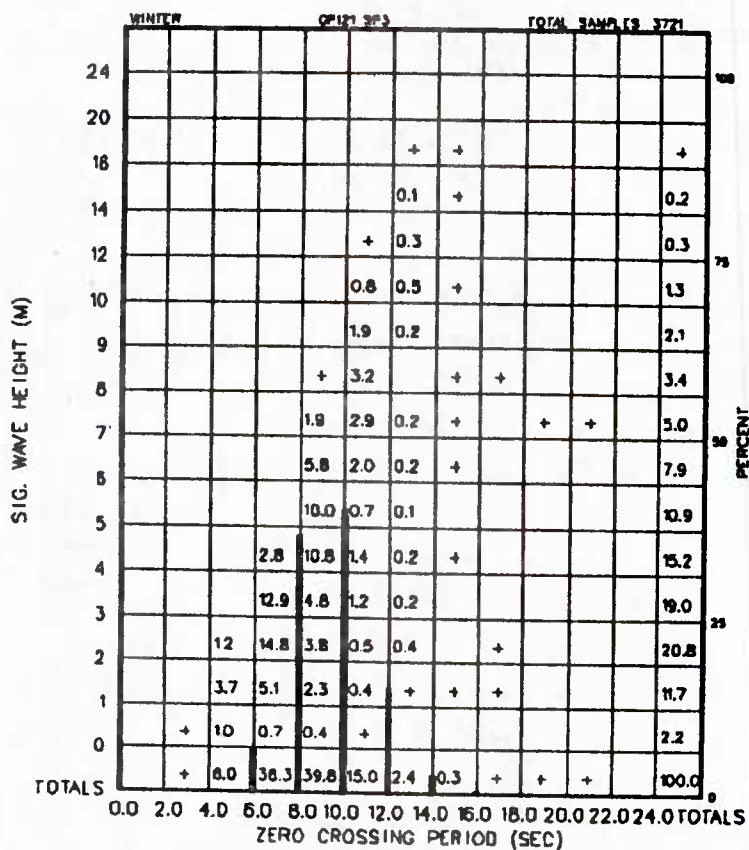


Figure A-3/121-2-6 Significant Wave Height vs. Zero Crossing Period

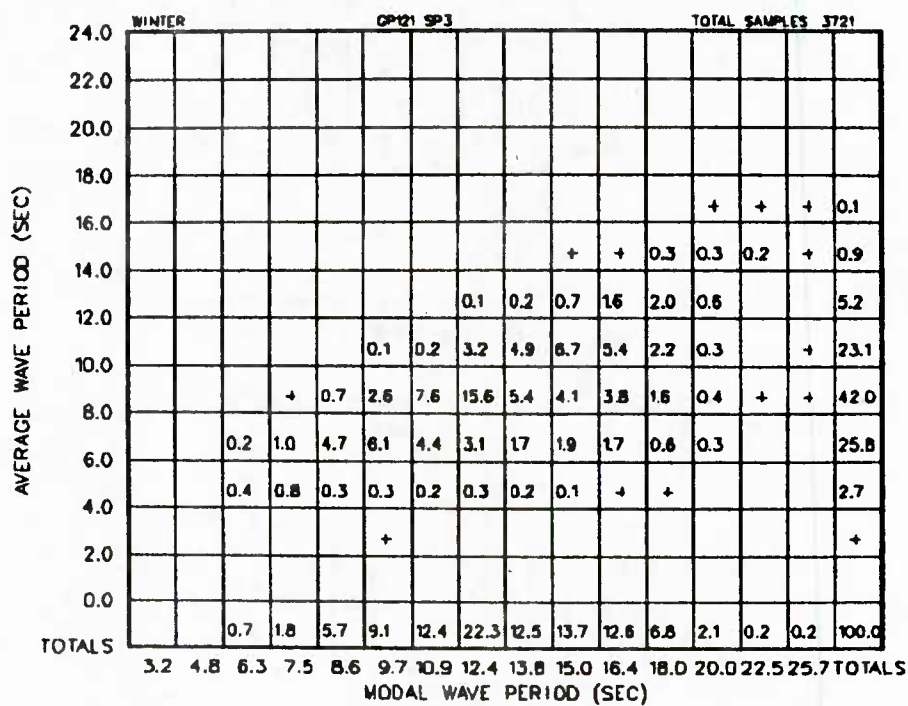


Figure A-3/121-2-9 Average Wave Period vs.
Modal Wave Period

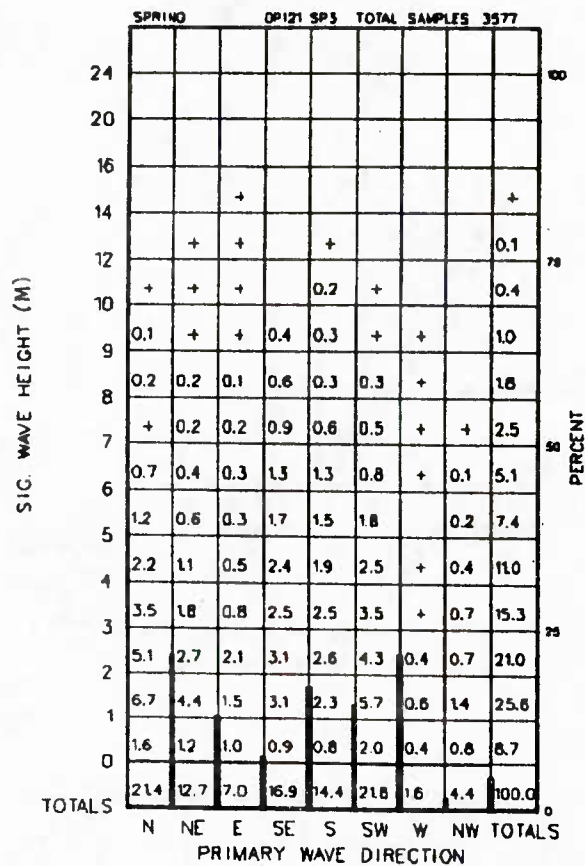


Figure A-3/121-3-3 Significant Wave Height vs. Primary Wave Direction

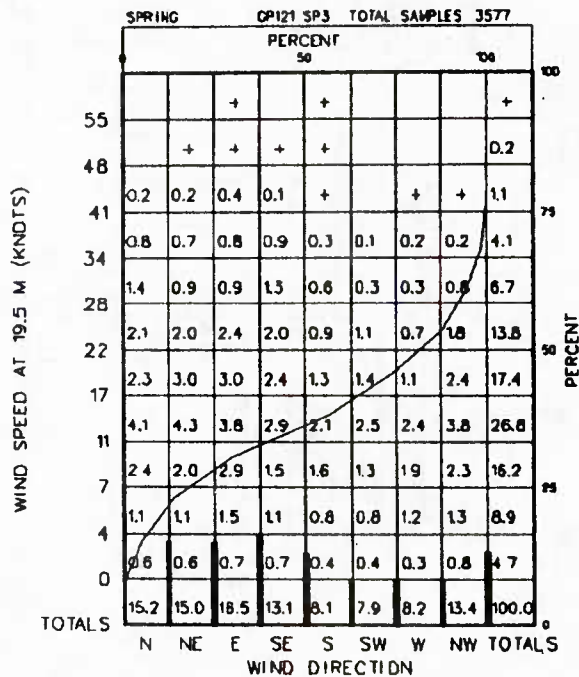
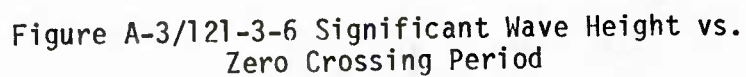


Figure A-3/121-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction





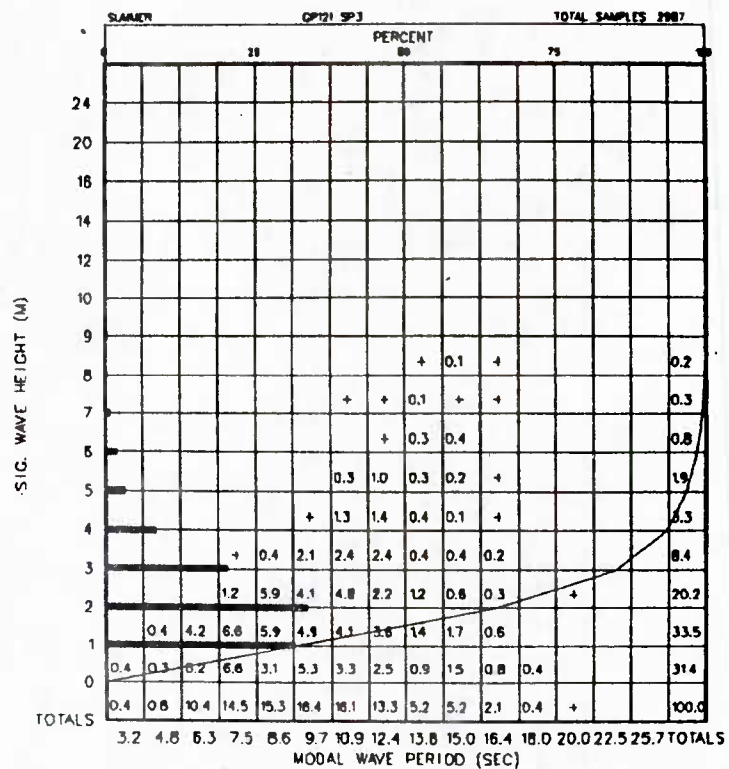


Figure A-3/121-4-1 Significant Wave Height vs. Modal Wave Period

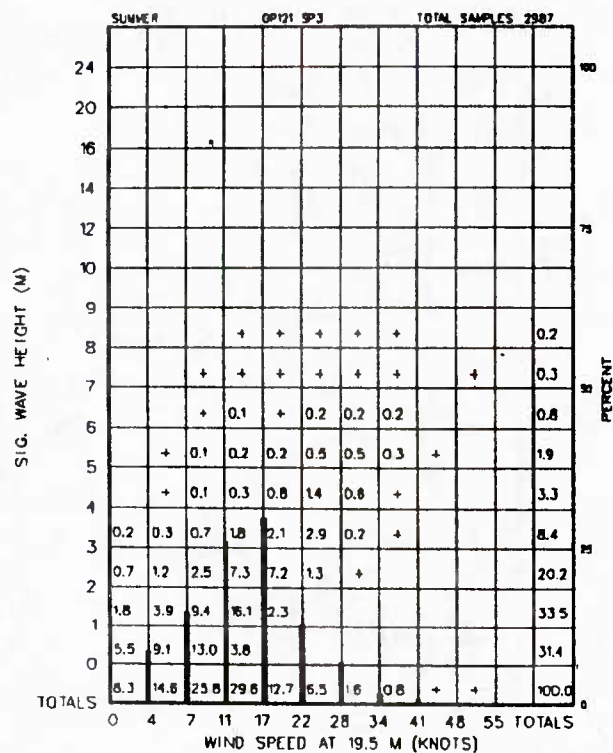


Figure A-3/121-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

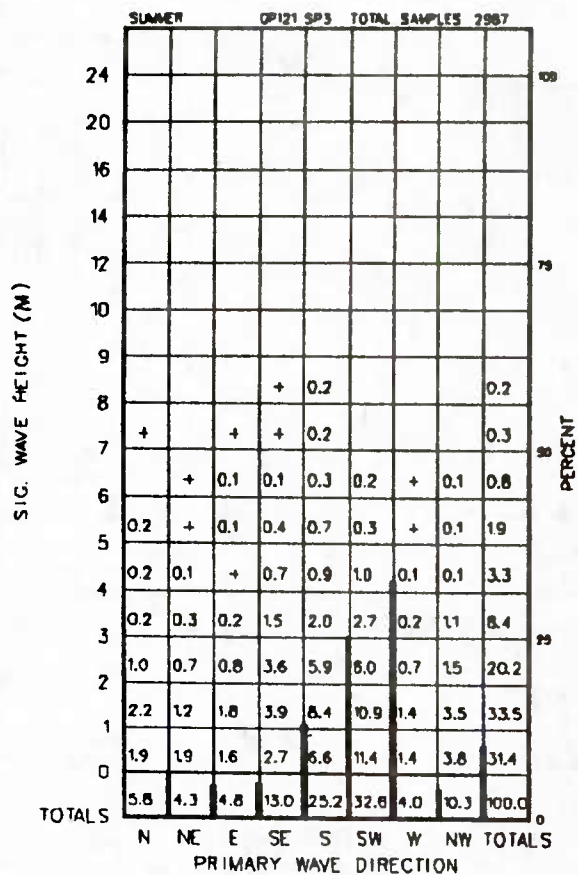


Figure A-3/121-4-3 Significant Wave Height vs. Primary Wave Direction

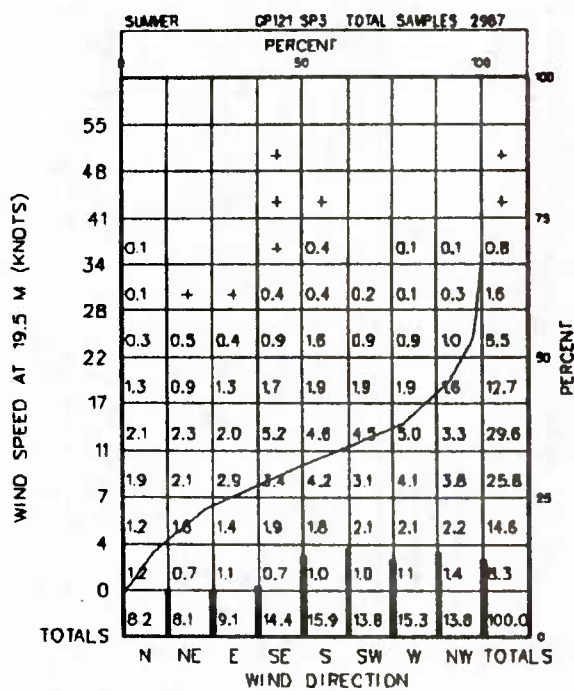


Figure A-3/121-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

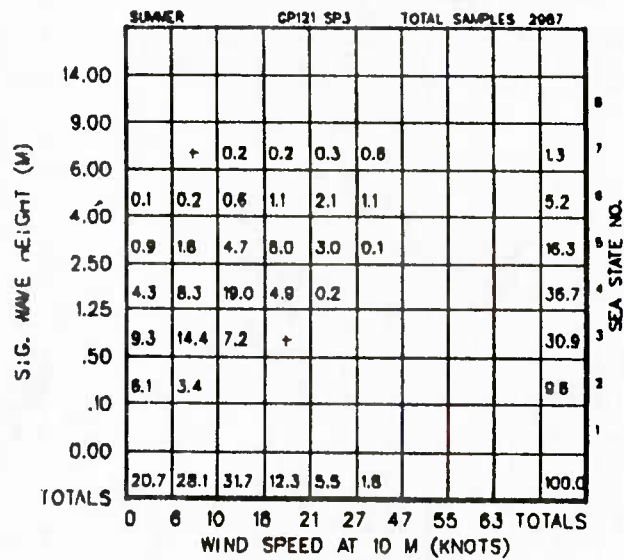


Figure A-3/121-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

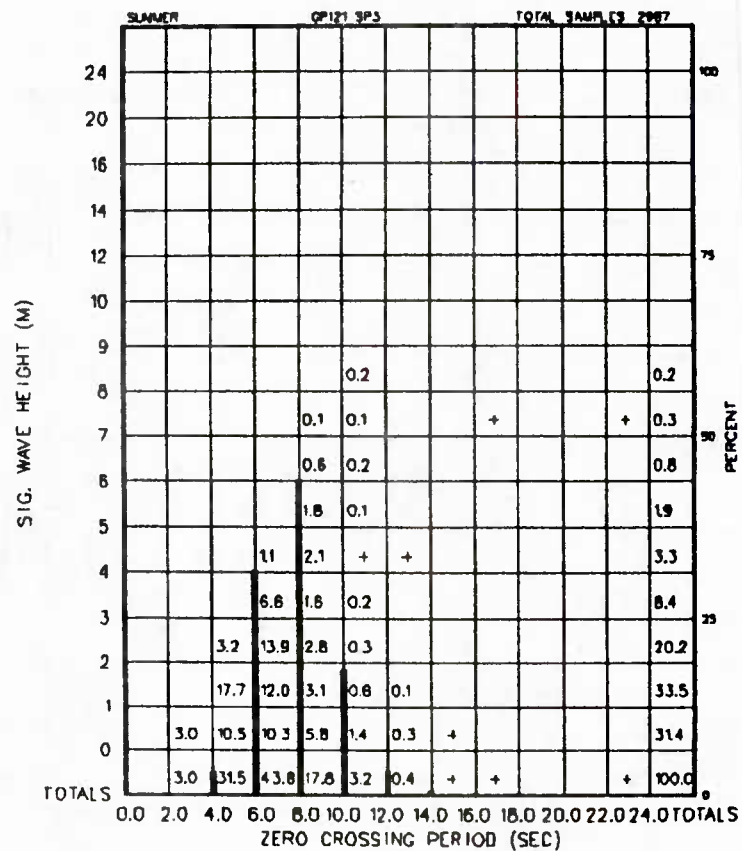


Figure A-3/121-4-6 Significant Wave Height vs. Zero Crossing Period

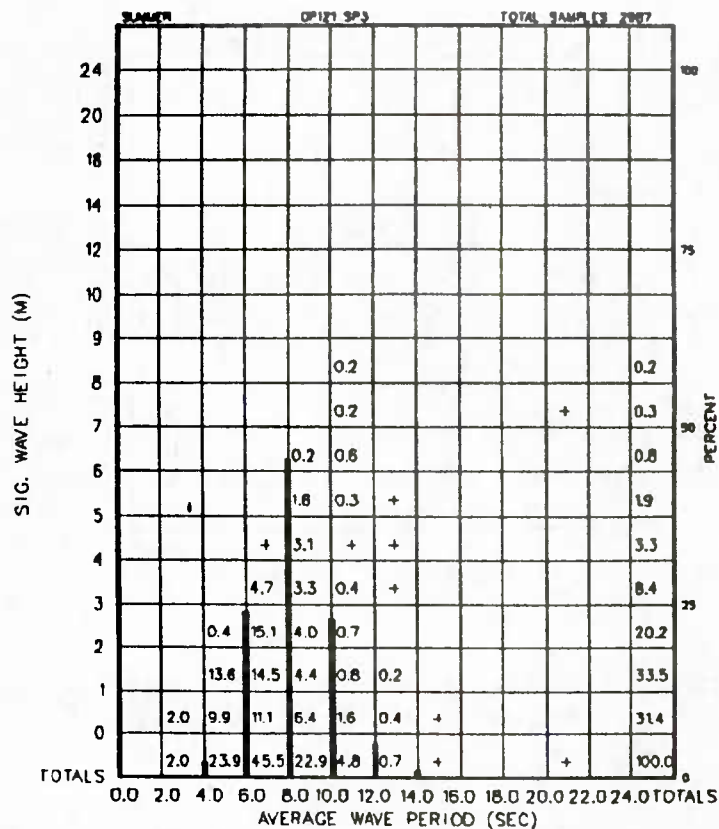


Figure A-3/121-4-7 Significant Wave Height vs. Average Wave Period

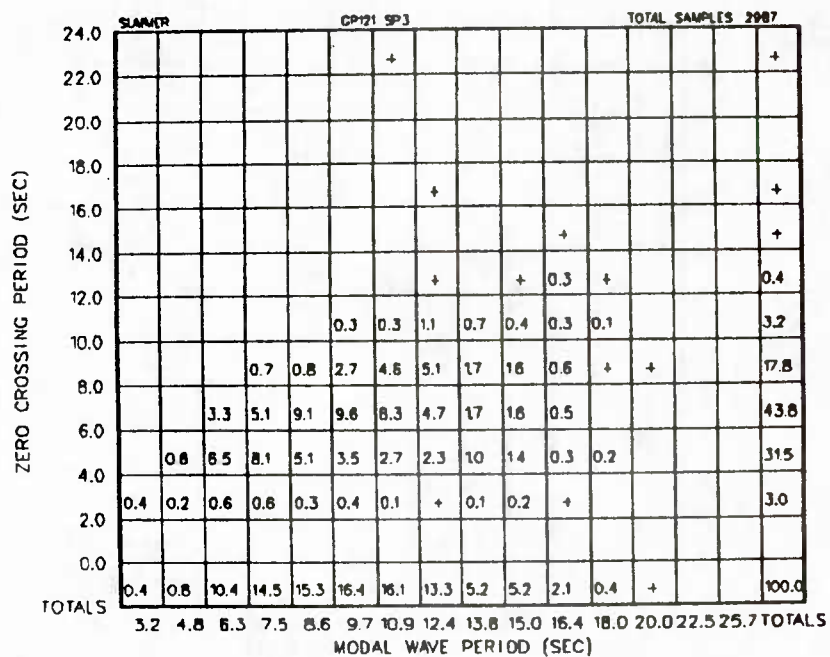


Figure A-3/121-4-8 Zero Crossing Period vs. Modal Wave Period

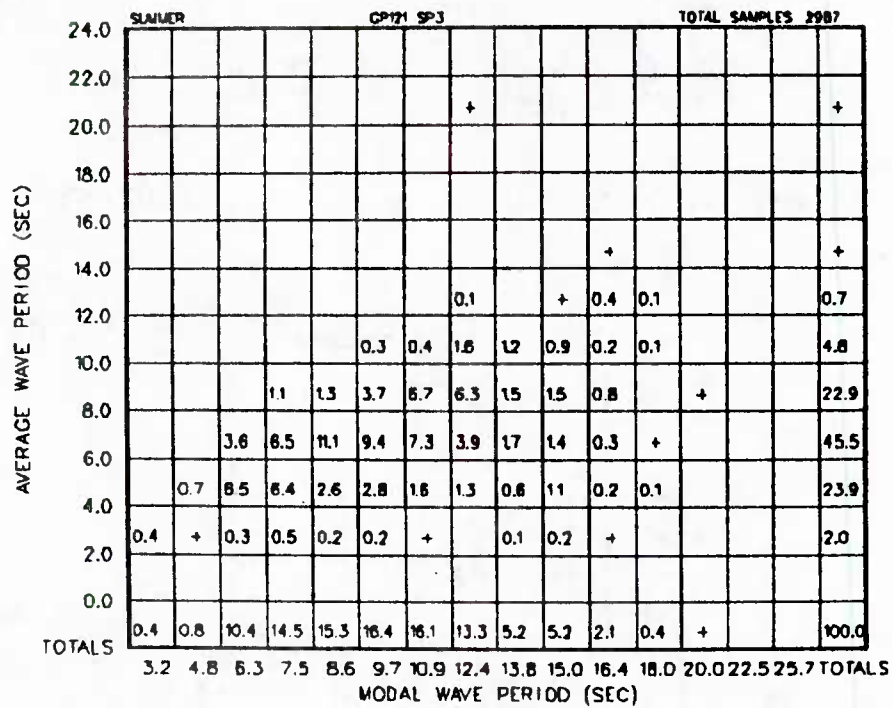


Figure A-3/121-4-9 Average Wave Period vs.
Modal Wave Period



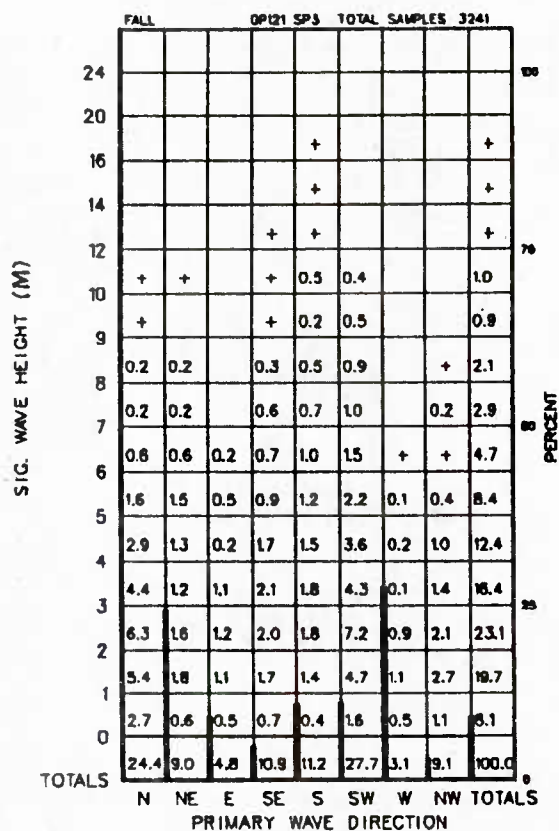


Figure A-3/121-5-3 Significant Wave Height vs. Primary Wave Direction

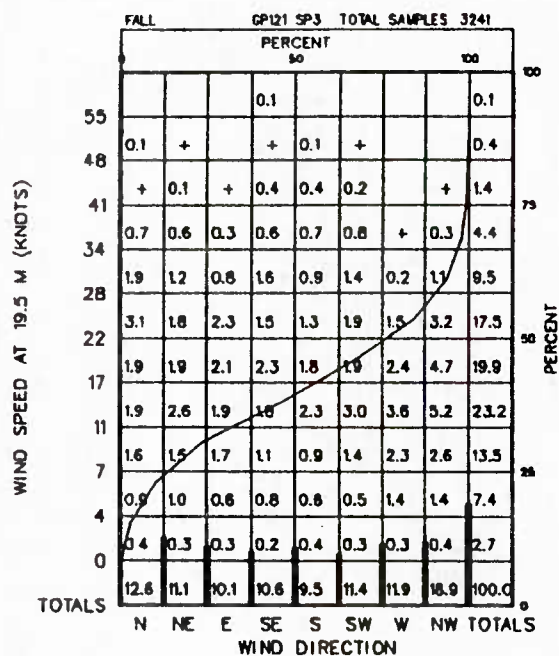
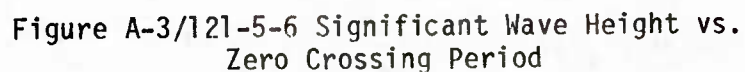
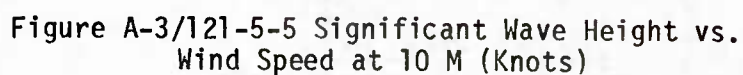


Figure A-3/121-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



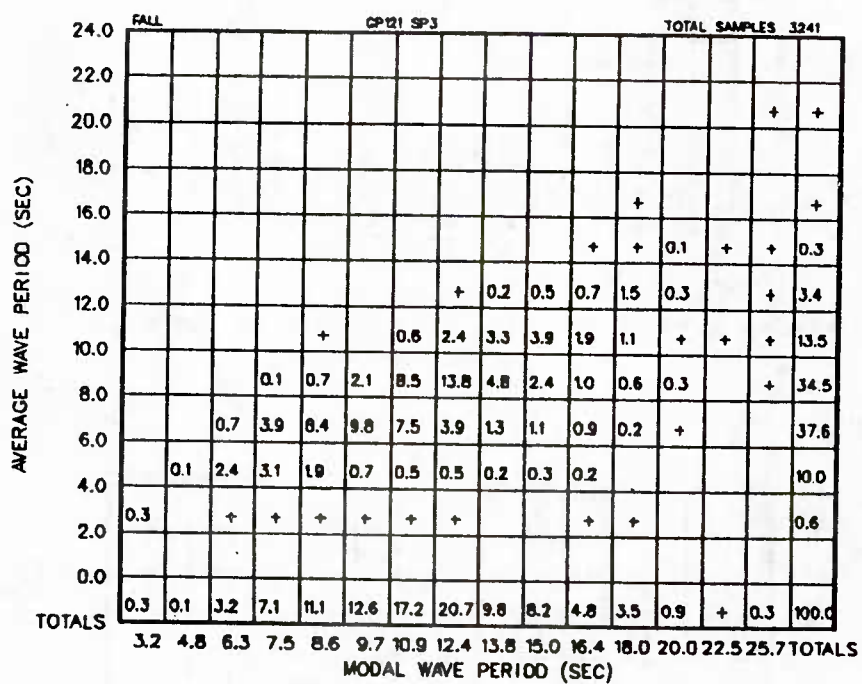


Figure A-3/121-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-124-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 51.31°N, 158.82°N					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	1 7.5 -	3.5 12 -	8.5 18 -	4 12 -	2.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1.25 -	18 3 -	39 7.5 -	19.5 3.5 -	14 2.5 W-SW
Visibility, nautical miles	0.5	8	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1.5 1	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 23% of the time Snow - 7% of the time (Dec-Mar)				
Relative Humidity, %	64	85	98	-	-
Air Temperature, °C	3	5	10	5.5	-
Sea Surface Temperature, °C	4	6.5	9	-	-
Sea Level Pressure, millibars	985	1010	1030	-	-
Ice	Moderate superstructure icing - 1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 3% 1%

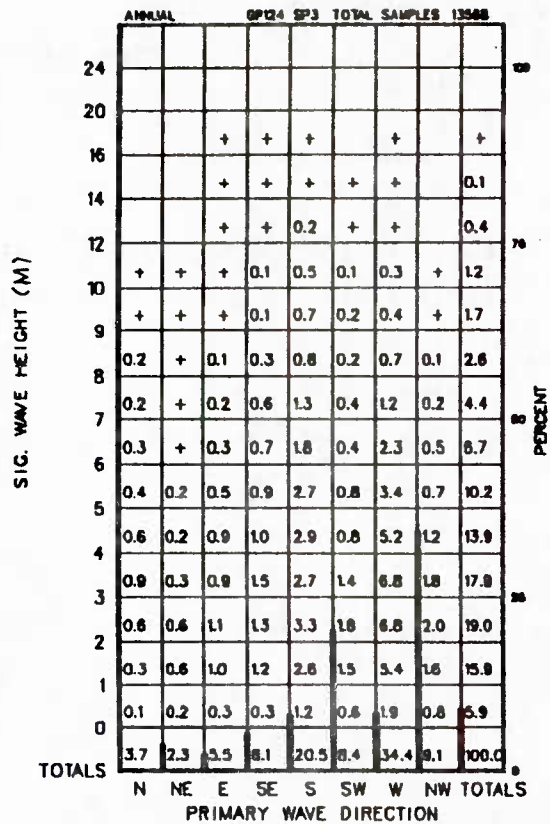


Figure A-124-1-3 Significant Wave Height vs. Primary Wave Direction

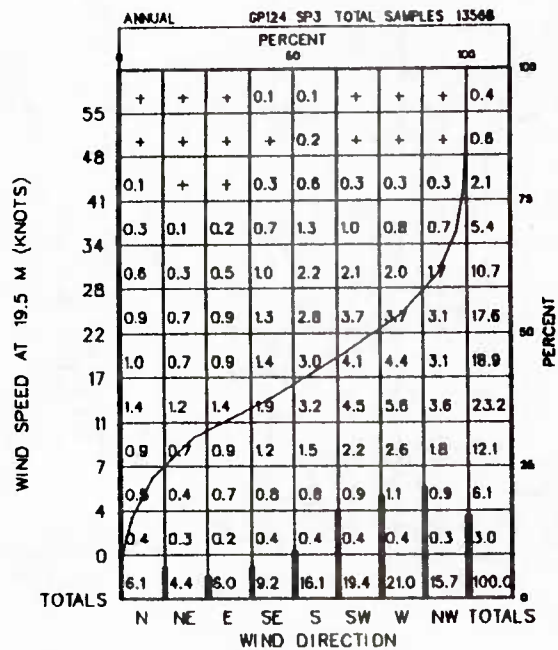


Figure A-124-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

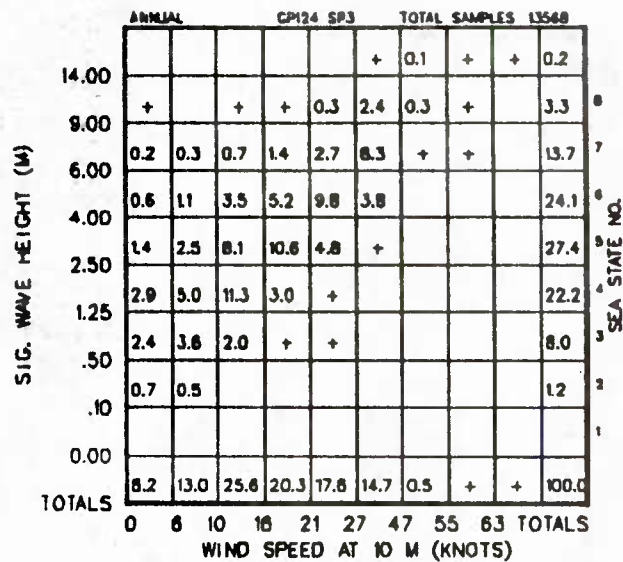


Figure A-124-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

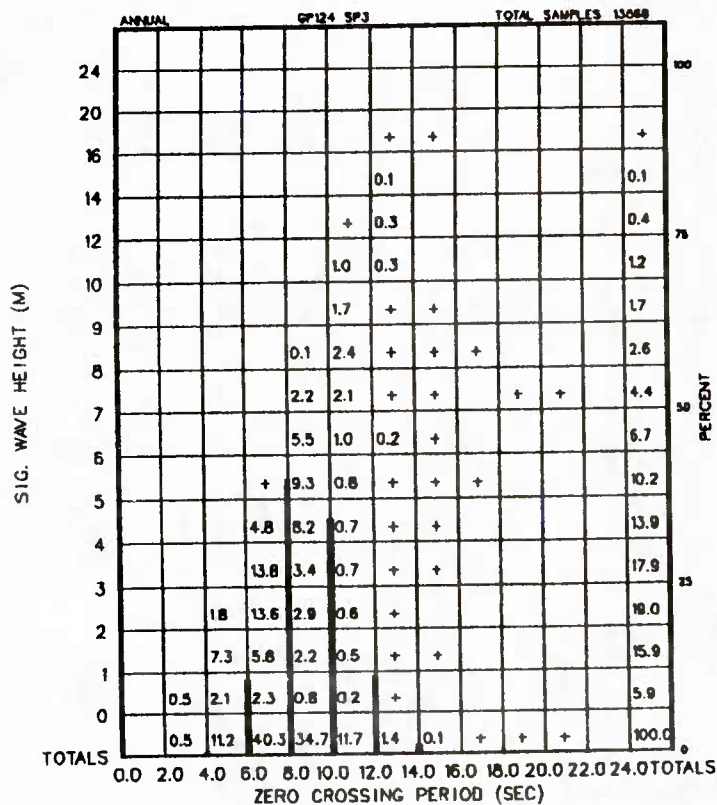


Figure A-124-1-6 Significant Wave Height vs. Zero Crossing Period

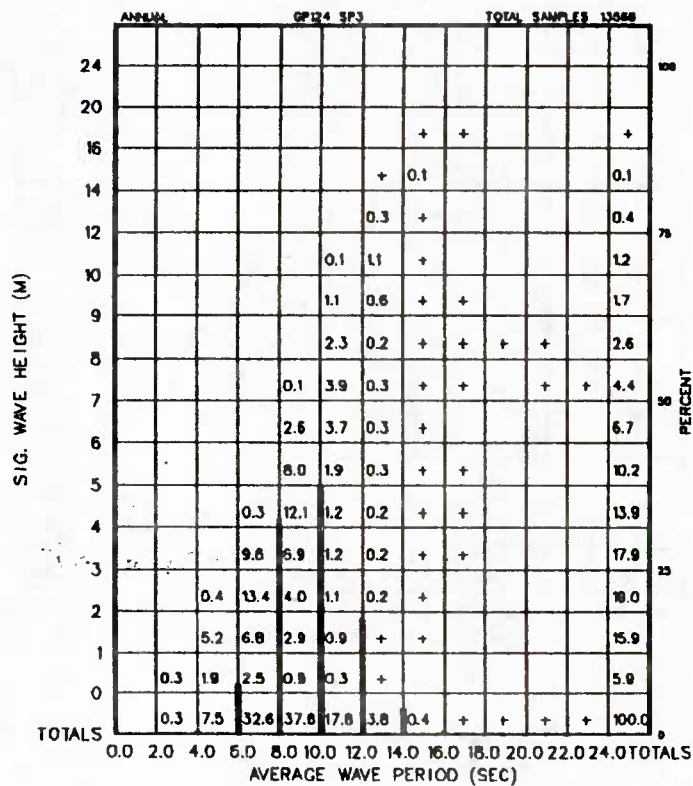


Figure A-124-1-7 Significant Wave Height vs. Average Wave Period

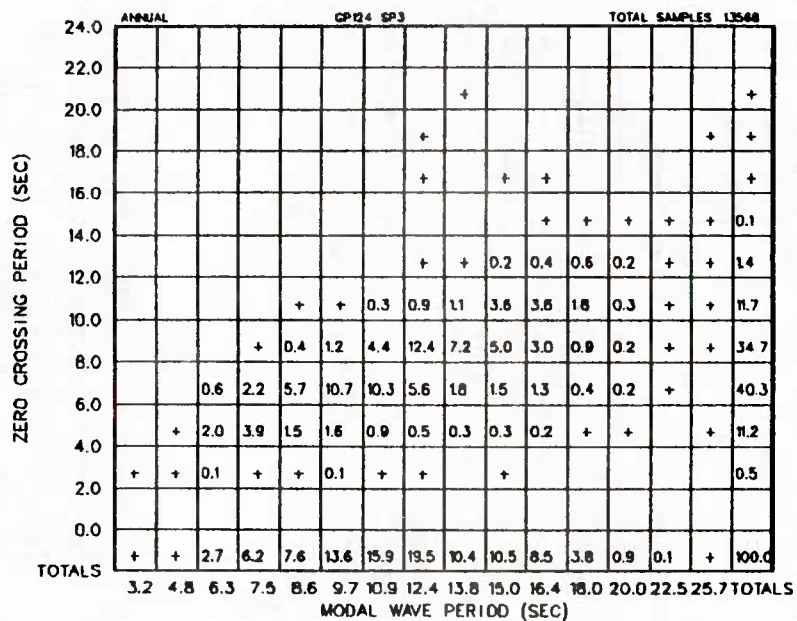
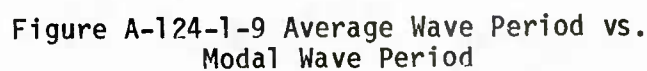


Figure A-124-1-8 Zero Crossing Period vs. Modal Wave Period



		ANNUAL																TOTAL SAMPLES 13509					
		OP124 SP3																					
WIND SPEED AT 19.5 M (KNOTS)	55	13	11	2	1		1													28	PERCENT		
	48	50	8			1	1													60			
	41	126	39	19	6															100			
	34	303	123	28	18	4	1													477			
	28	566	179	86	38	9	3	4	2	1										868			
	22	809	292	137	64	31	14	5	8											1358			
	17	928	367	116	50	25	16	9	2	1	3						1			1518			
	11	839	354	173	93	40	24	17	7	4	4	4	4		1	1				1585			
	7	646	209	82	33	13	8	7		4	1									1001			
	4	403	103	30	15	7	1	1	1	1										542			
0	221	51	15	6	2				1										298				
TOTALS	4904	1738	888	324	132	87	43	19	11	8	4	4		1	1		1		7943				
		DURATION (HOURS)																					
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-124-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

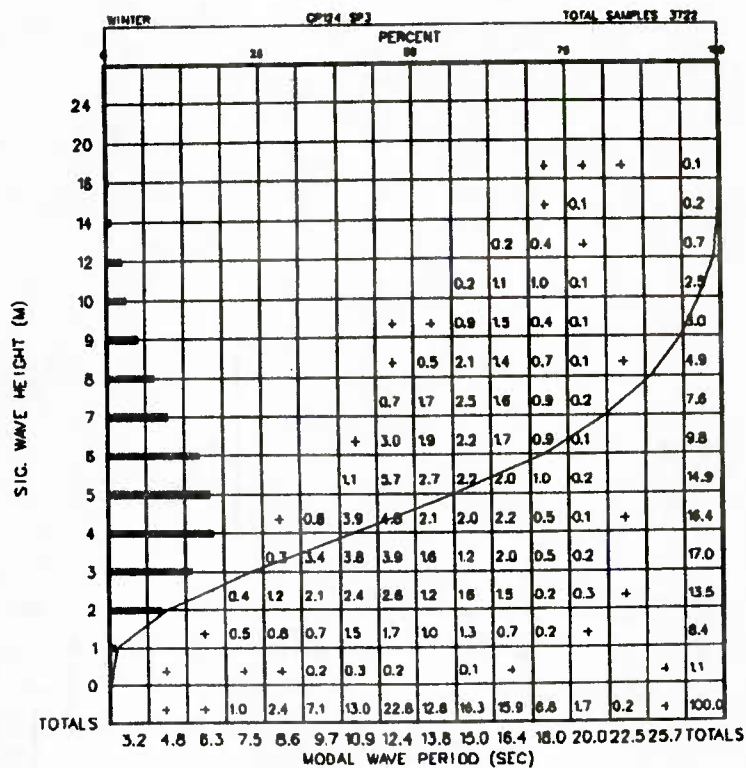


Figure A-124-2-1 Significant Wave Height vs. Modal Wave Period

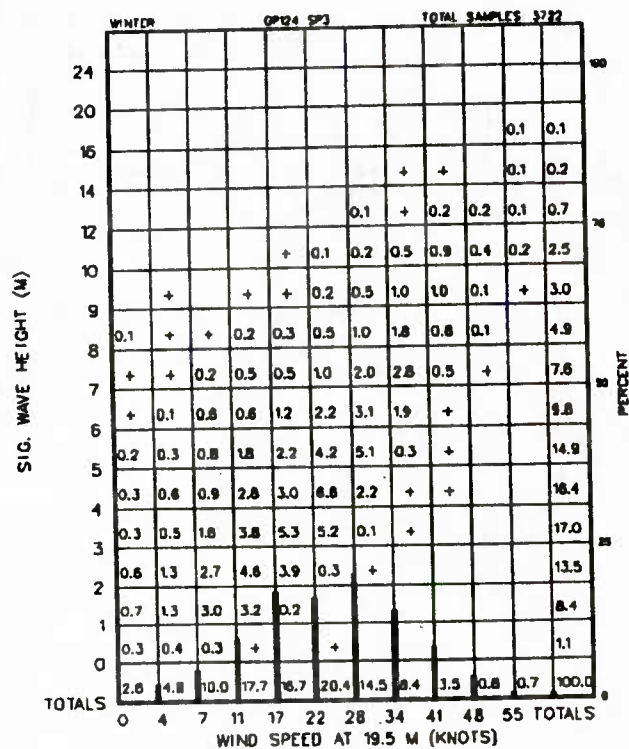


Figure A-124-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

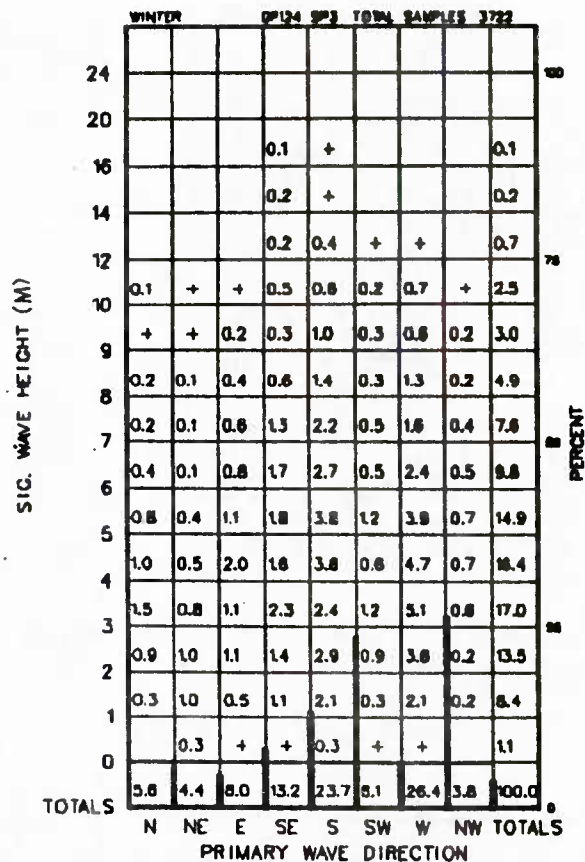


Figure A-124-2-3 Significant Wave Height vs. Primary Wave Direction

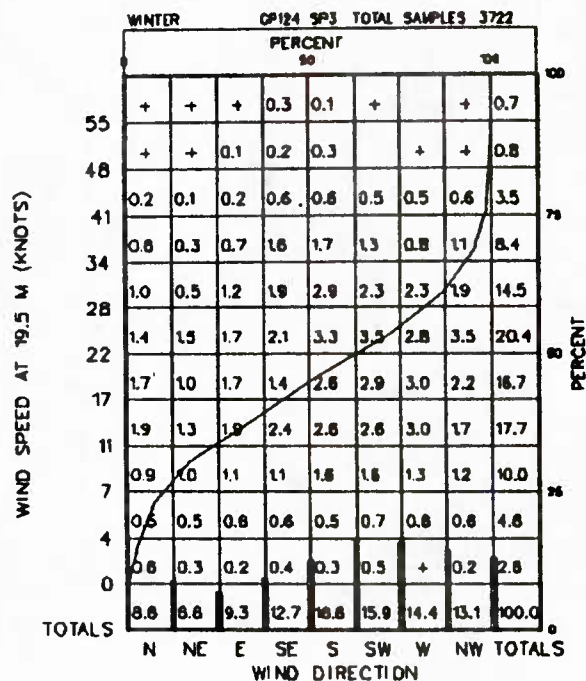


Figure A-124-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

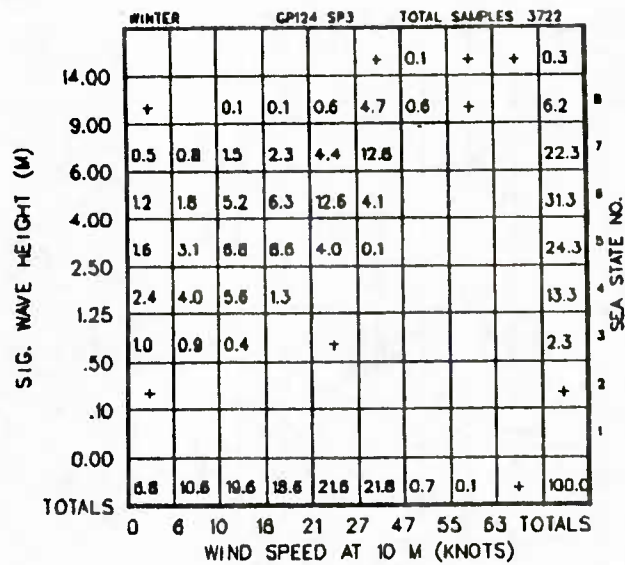


Figure A-124-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

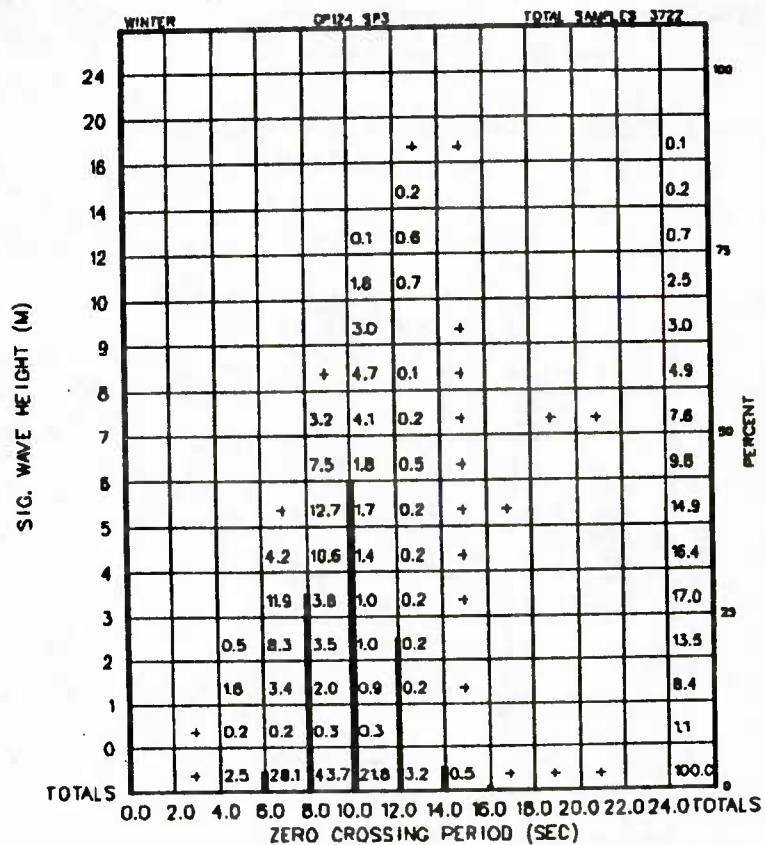


Figure A-124-2-6 Significant Wave Height vs. Zero Crossing Period

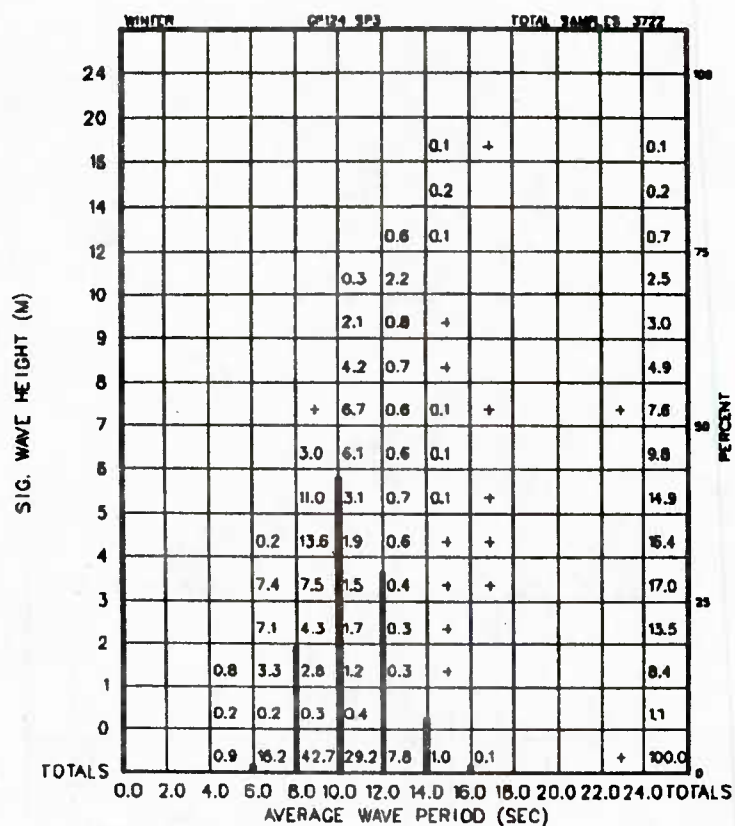


Figure A-124-2-7 Significant Wave Height vs. Average Wave Period

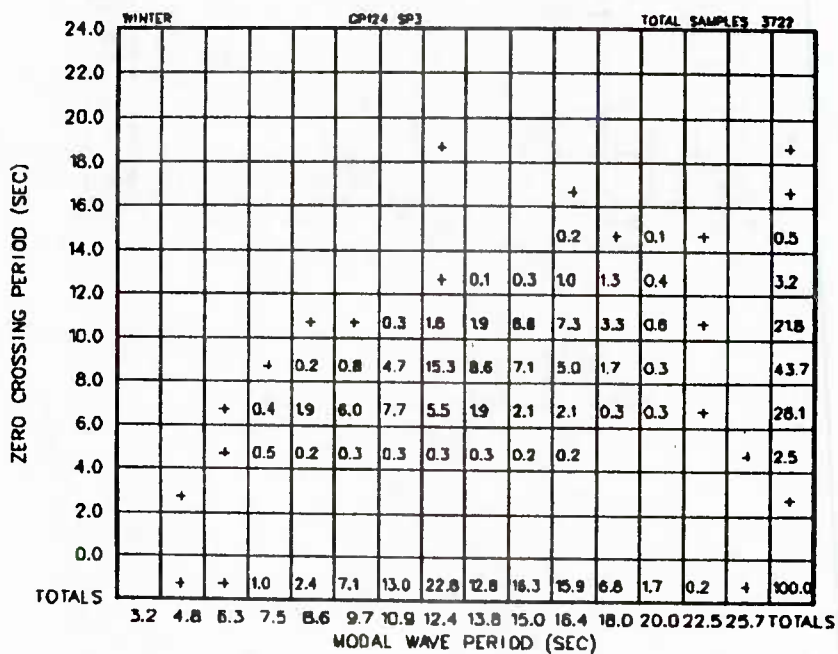


Figure A-124-2-8 Zero Crossing Period vs. Modal Wave Period

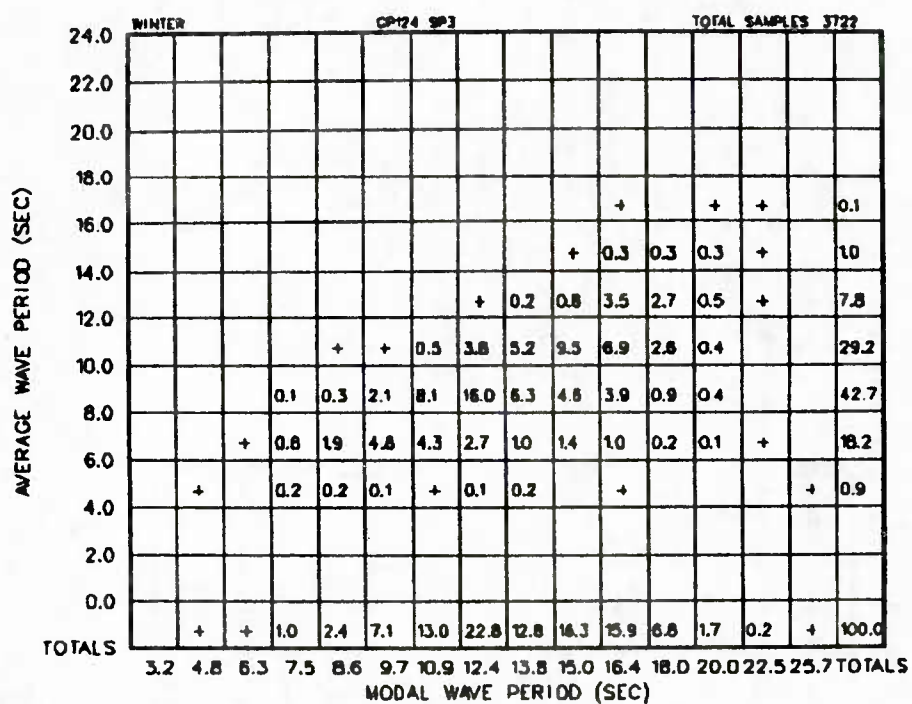


Figure A-124-2-9 Average Wave Period vs.
Modal Wave Period

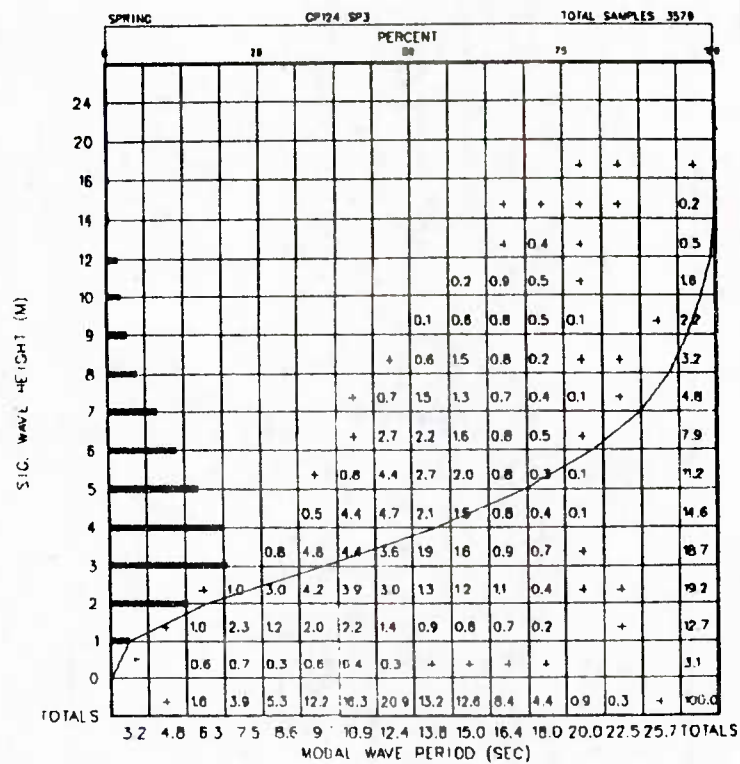


Figure A-124-3-1 Significant Wave Height vs. Modal Wave Period

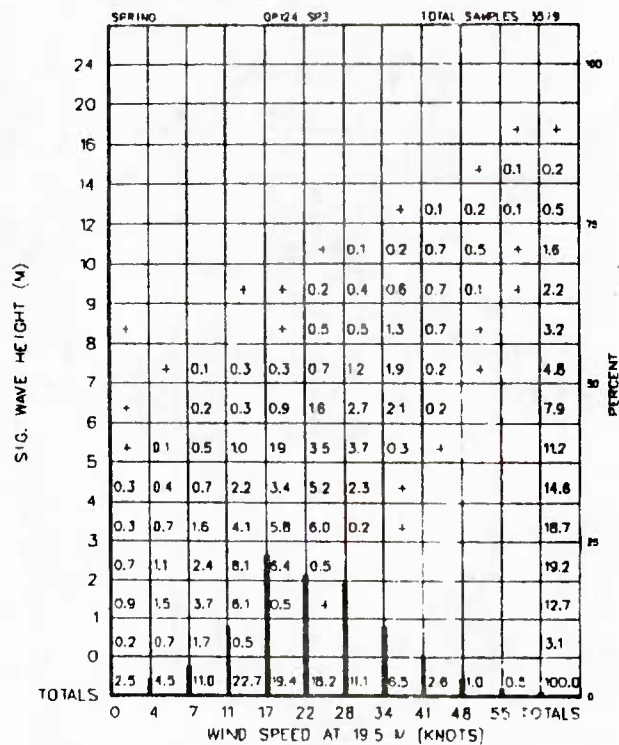


Figure A-124-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

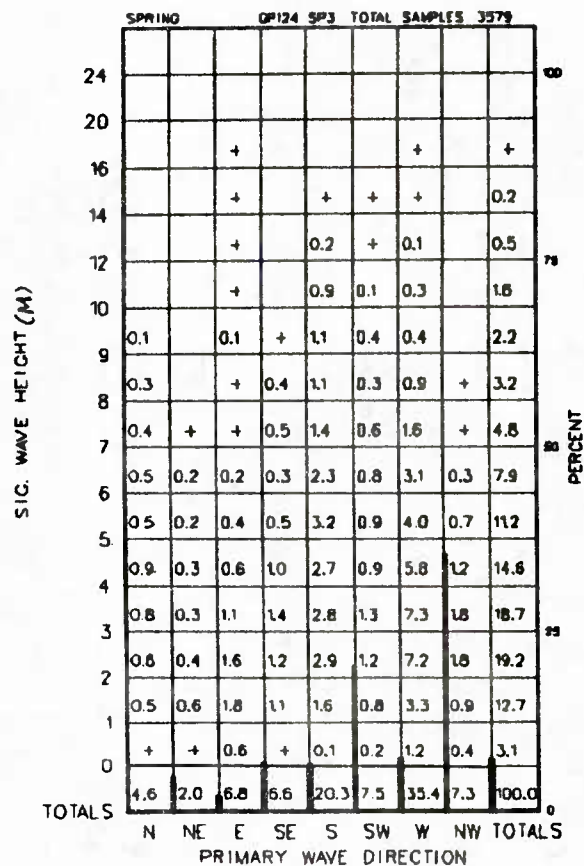


Figure A-124-3-3 Significant Wave Height vs. Primary Wave Direction

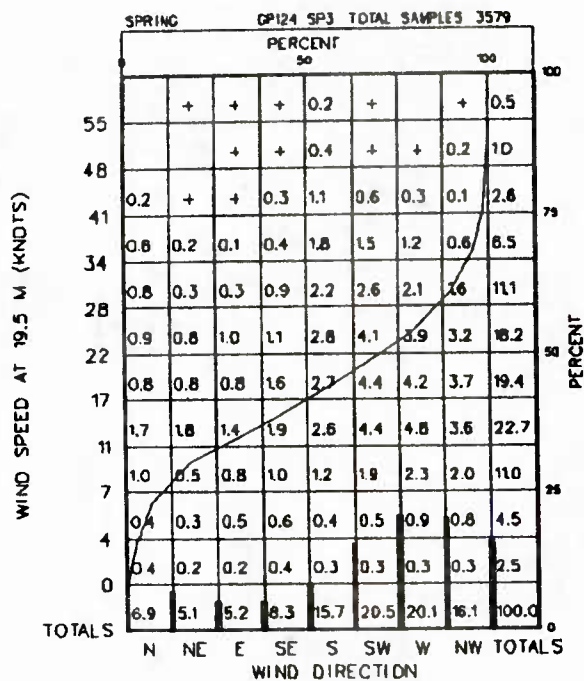


Figure A-124-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

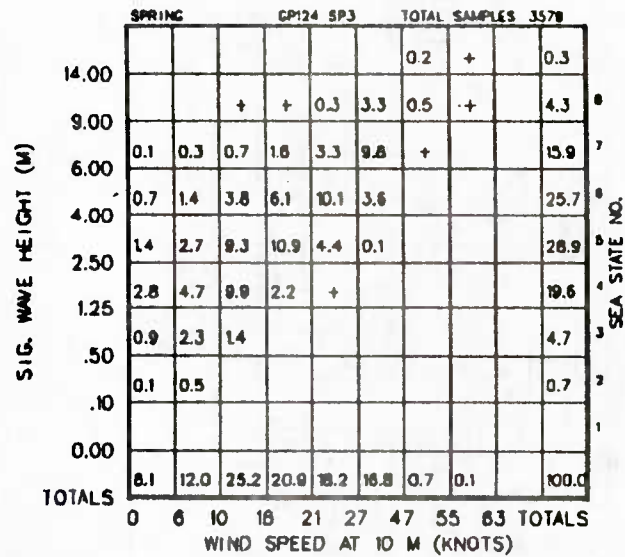


Figure A-124-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

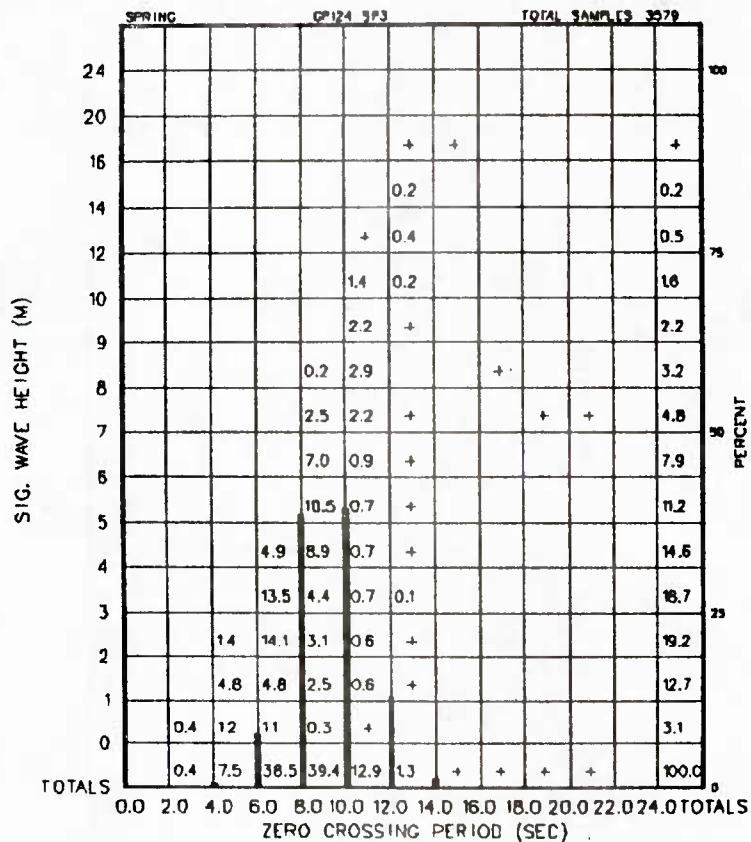


Figure A-124-3-6 Significant Wave Height vs. Zero Crossing Period

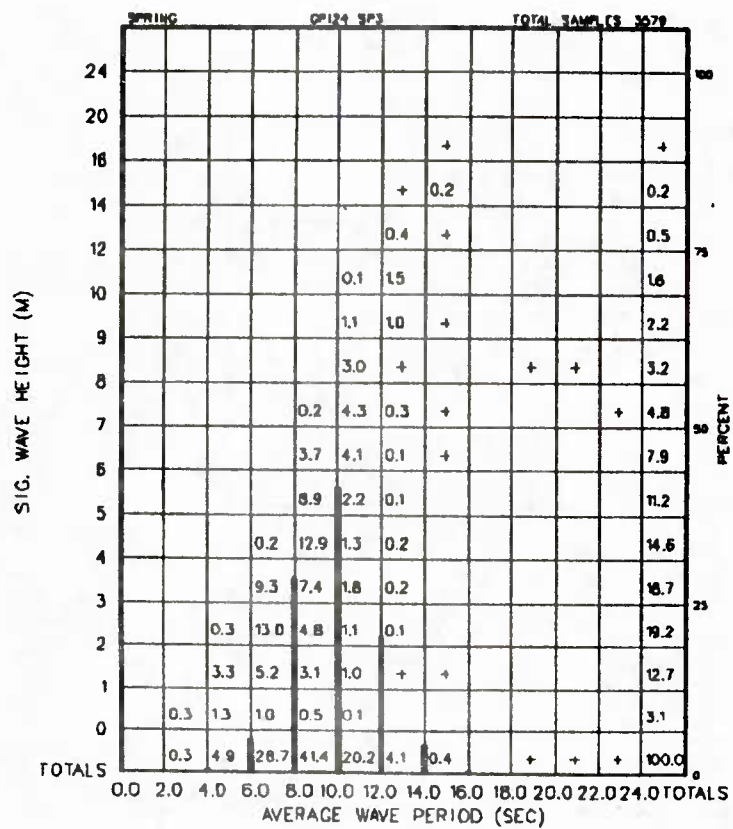


Figure A-124-3-7 Significant Wave Height vs. Average Wave Period

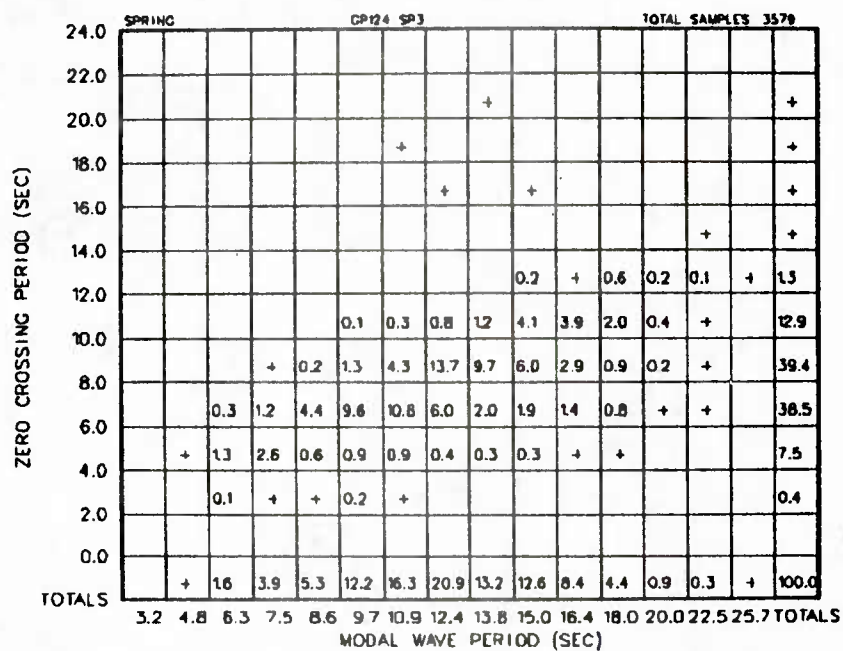


Figure A-124-3-8 Zero Crossing Period vs. Modal Wave Period

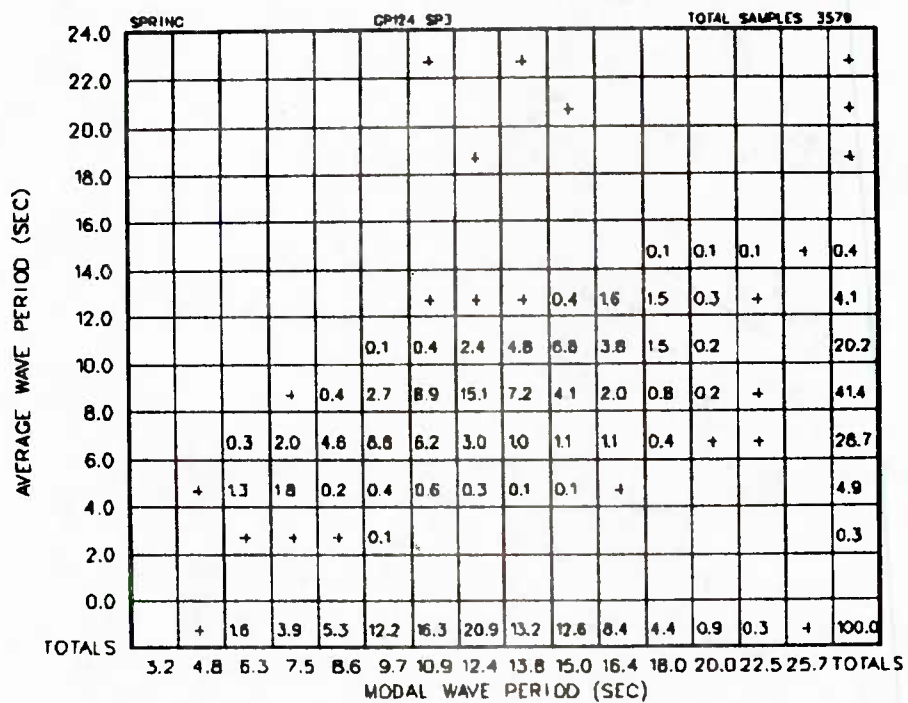


Figure A-124-3-9 Average Wave Period vs.
Modal Wave Period

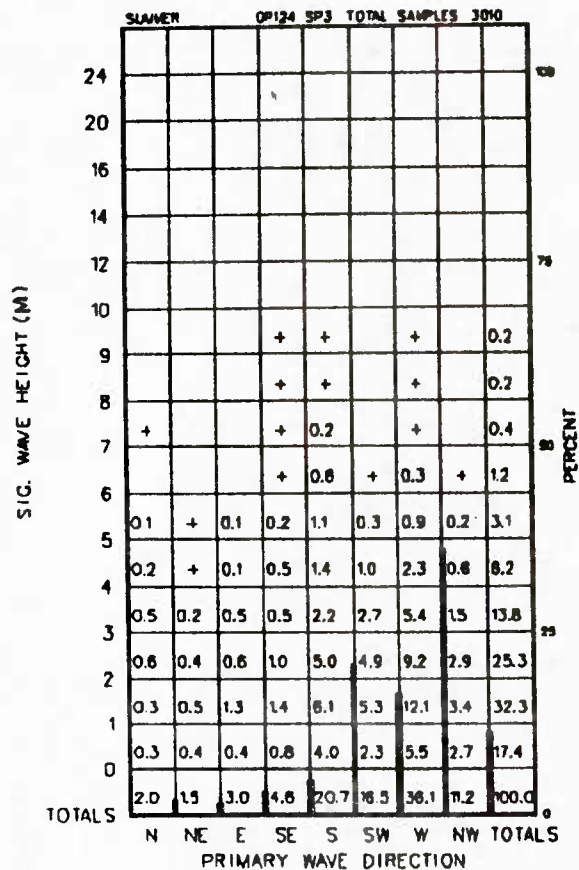


Figure A-124-4-3 Significant Wave Height vs. Primary Wave Direction

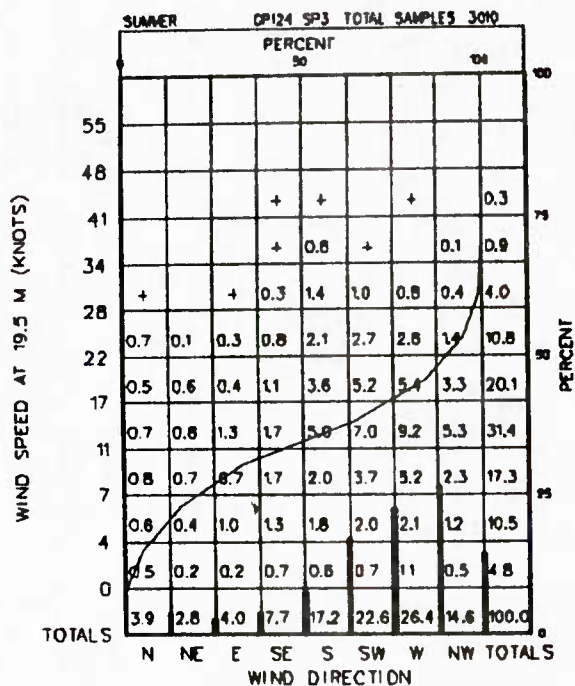


Figure A-124-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

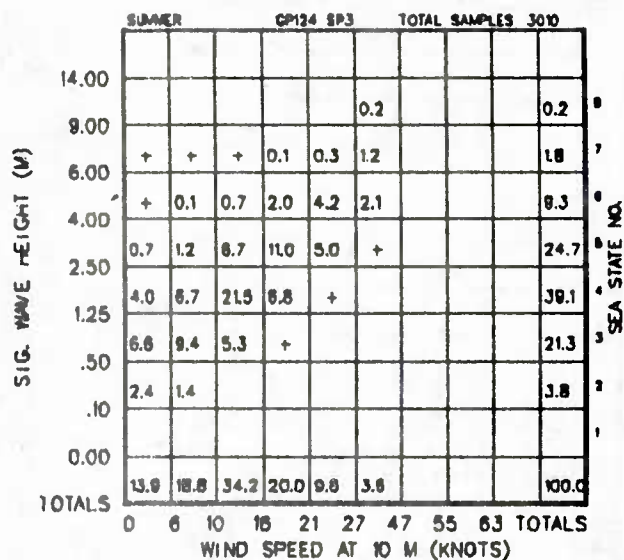


Figure A-124-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

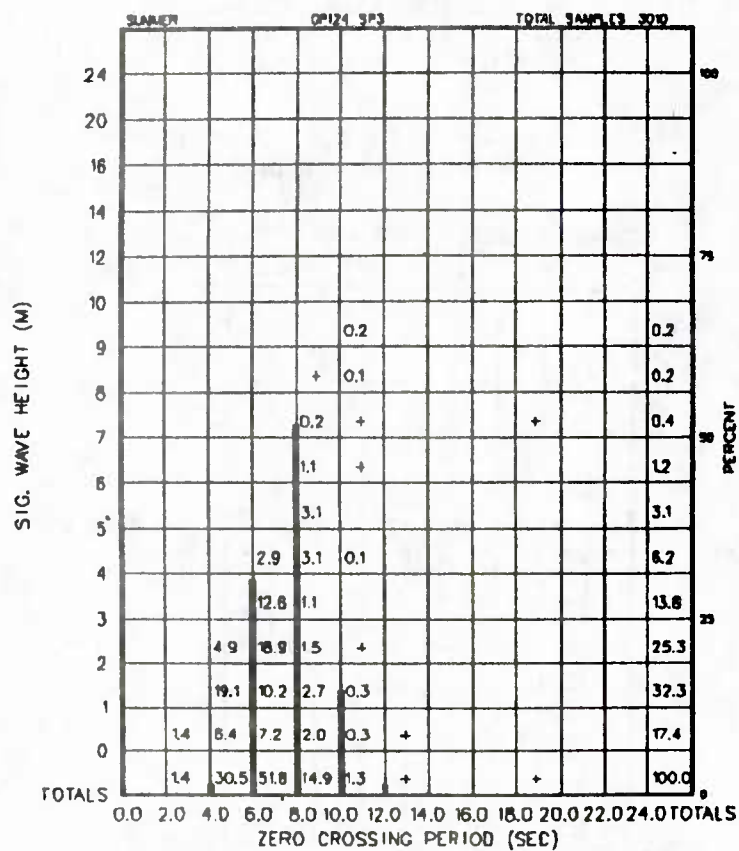


Figure A-124-4-6 Significant Wave Height vs. Zero Crossing Period

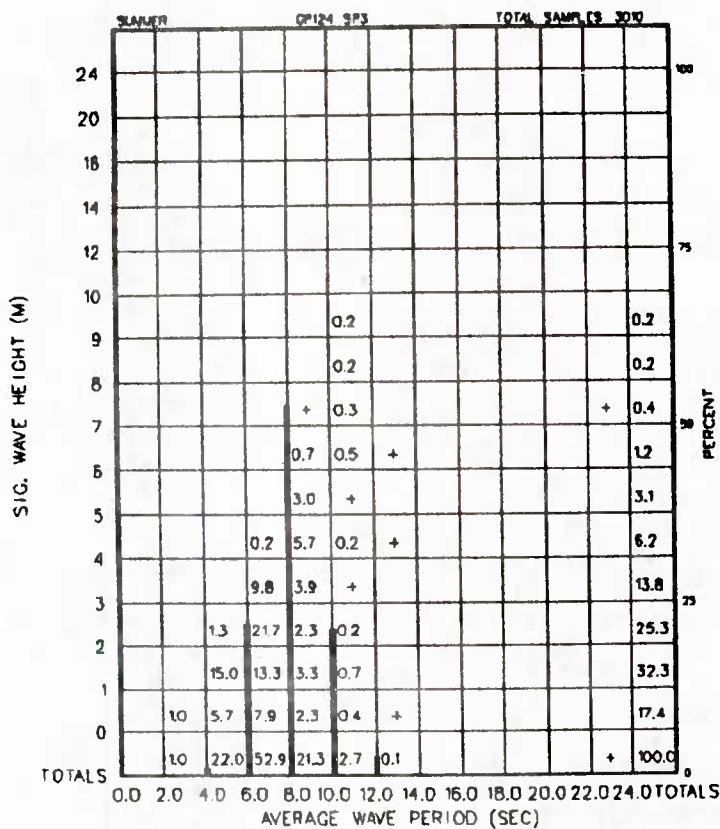


Figure A-124-4-7 Significant Wave Height vs. Average Wave Period

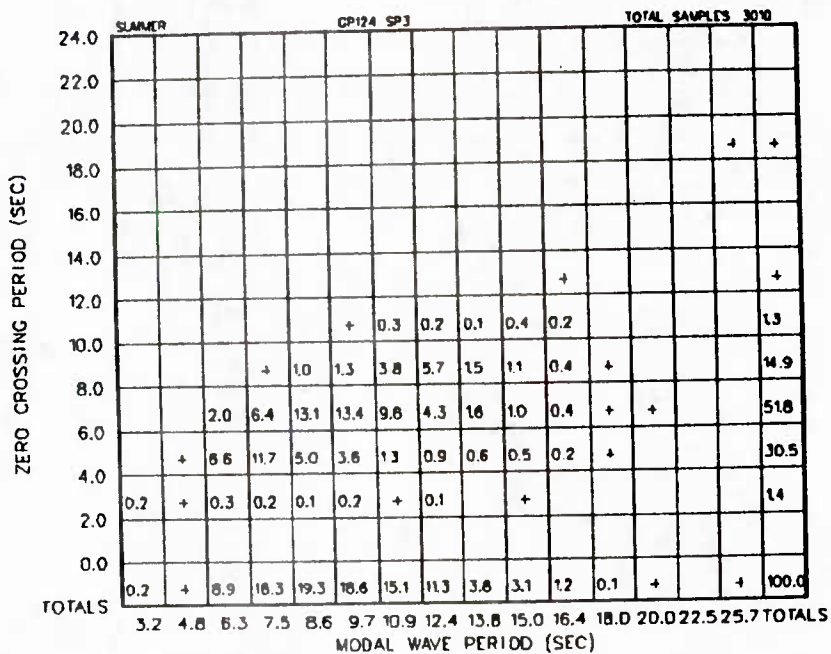


Figure A-124-4-8 Zero Crossing Period vs. Modal Wave Period

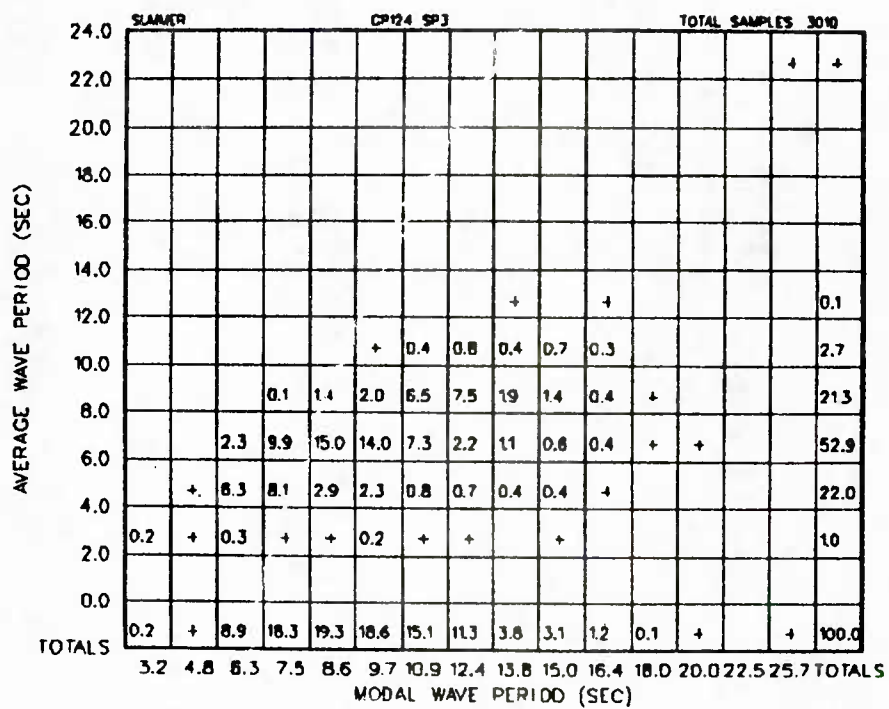


Figure A-124-4-9 Average Wave Period vs.
Modal Wave Period

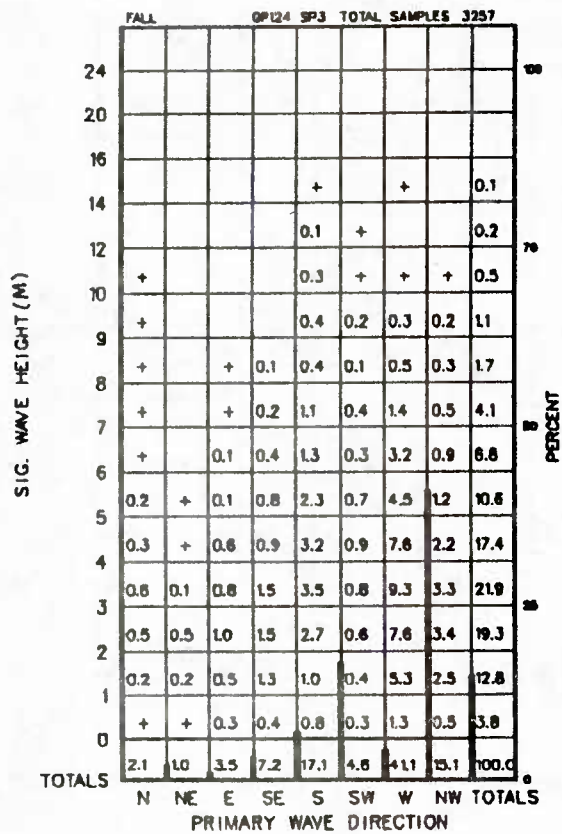


Figure A-124-5-3 Significant Wave Height vs. Primary Wave Direction

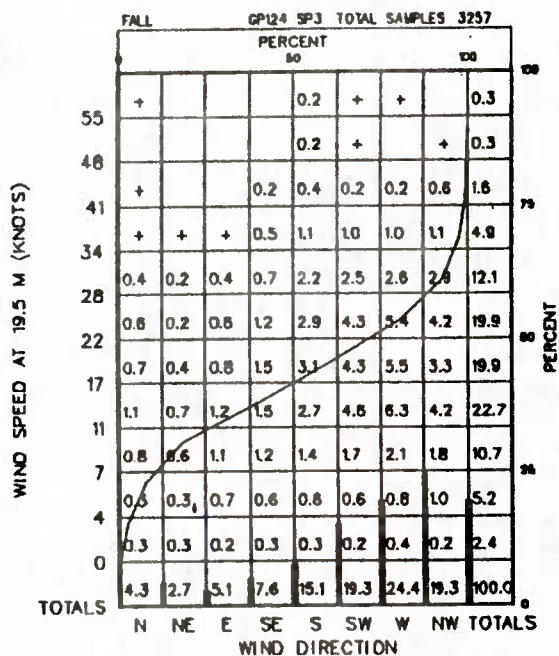


Figure A-124-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

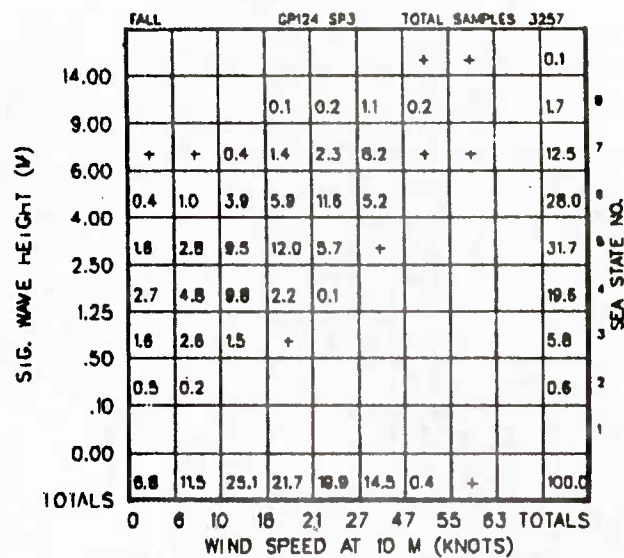


Figure A-124-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

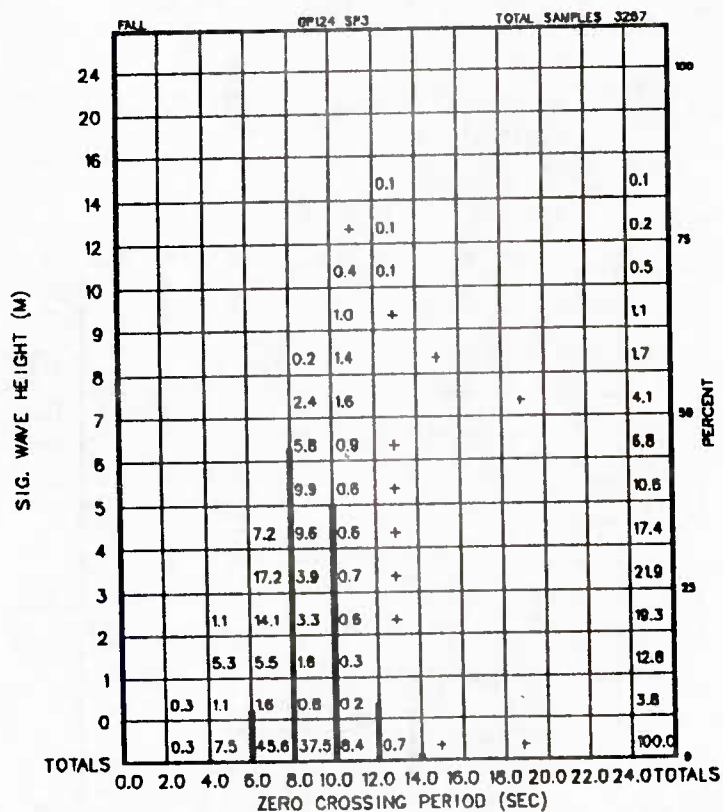


Figure A-124-5-6 Significant Wave Height vs. Zero Crossing Period



TABLE A-148-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 43.17°N, 141.43°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	3 11.5 -	7.5 16 -	3.25 11.75 -	1.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4.5 0.75 -	16.5 2.75 -	37 7.5 -	17.25 3 -	14 2.5 SW-W
Visibility, nautical miles	1	10	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 16% of the time		Snow - 2% of the time (Dec-Mar)		
Relative Humidity, %	62	83	98	-	-
Air Temperature, °C	7	9.5	13.5	10	-
Sea Surface Temperature, °C	9	12	15	-	-
Sea Level Pressure, millibars	995	1018	1035	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 2% 2%

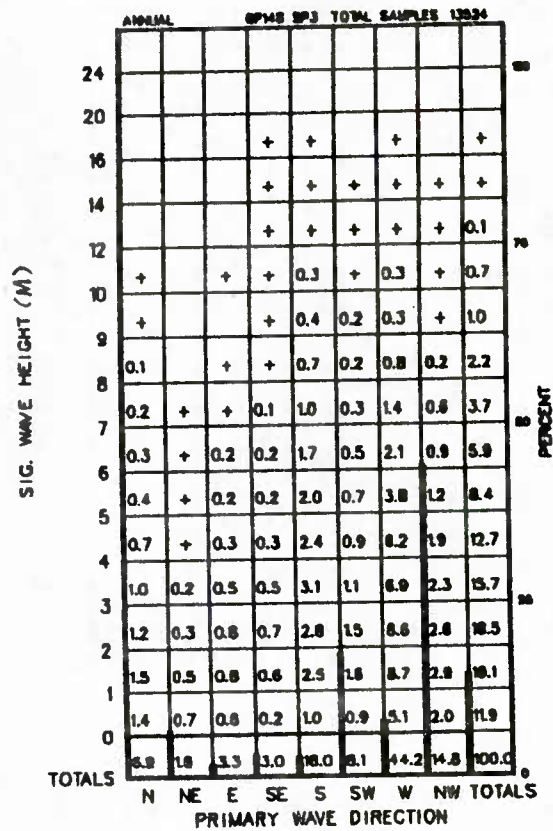


Figure A-148-1-3 Significant Wave Height vs. Primary Wave Direction

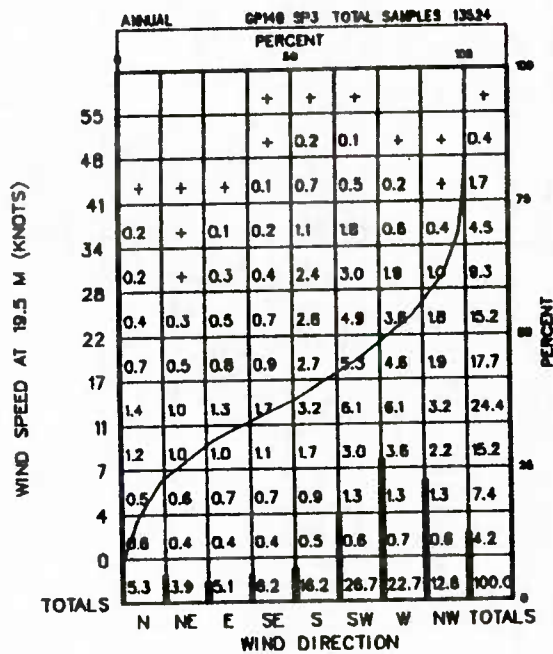


Figure A-148-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

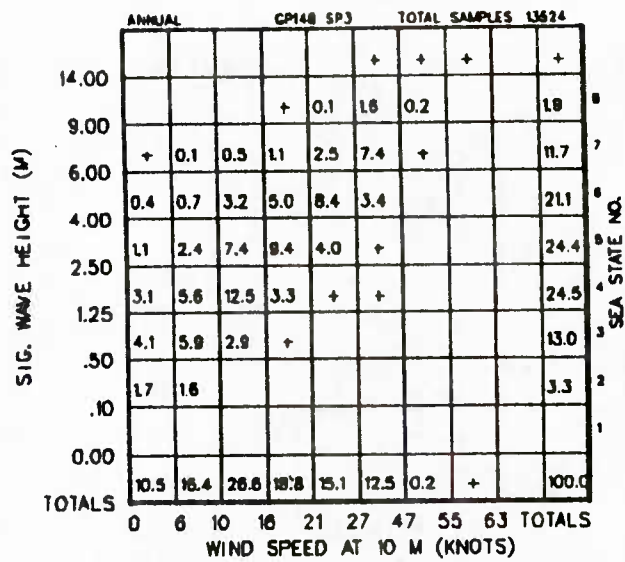


Figure A-148-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

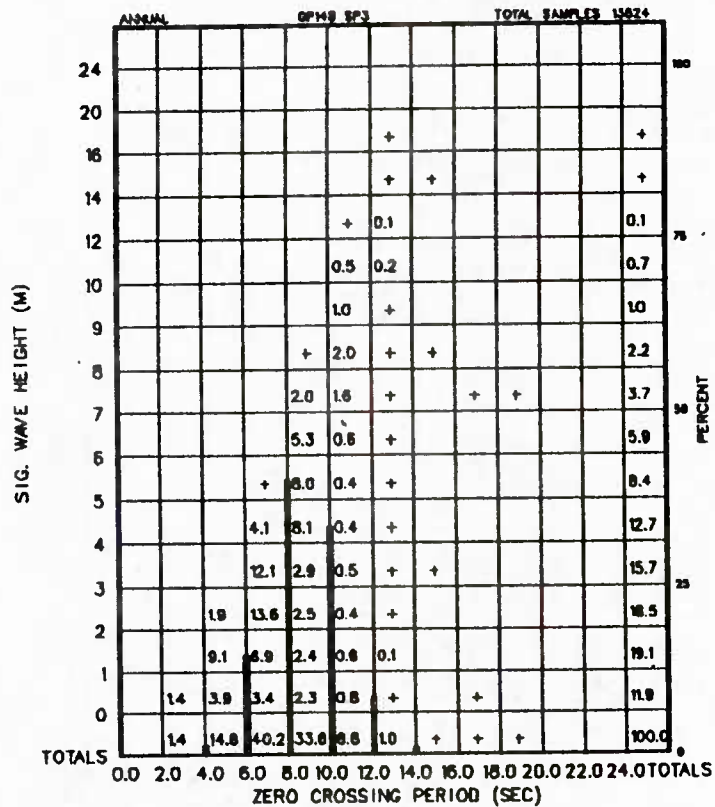


Figure A-148-1-6 Significant Wave Height vs. Zero Crossing Period

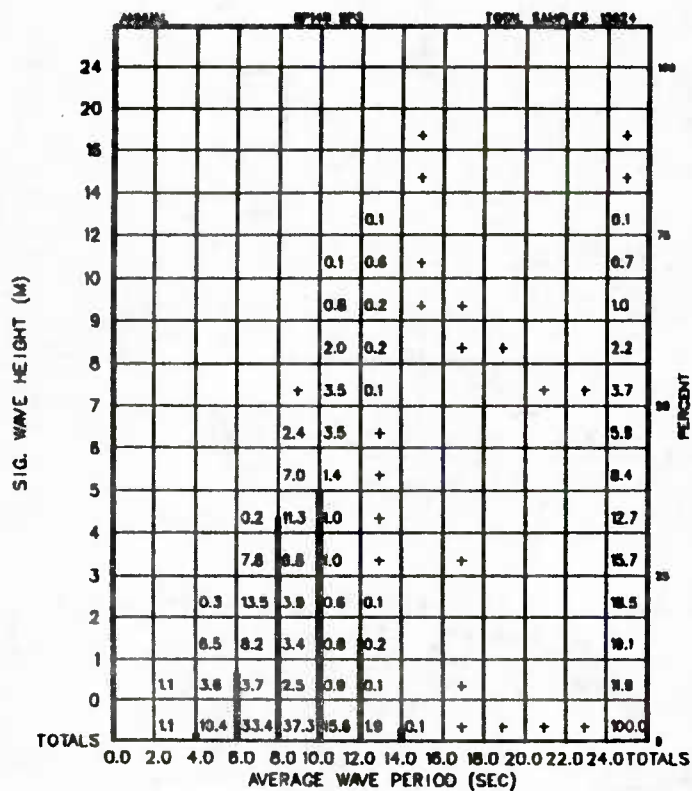


Figure A-148-1-7 Significant Wave Height vs. Average Wave Period

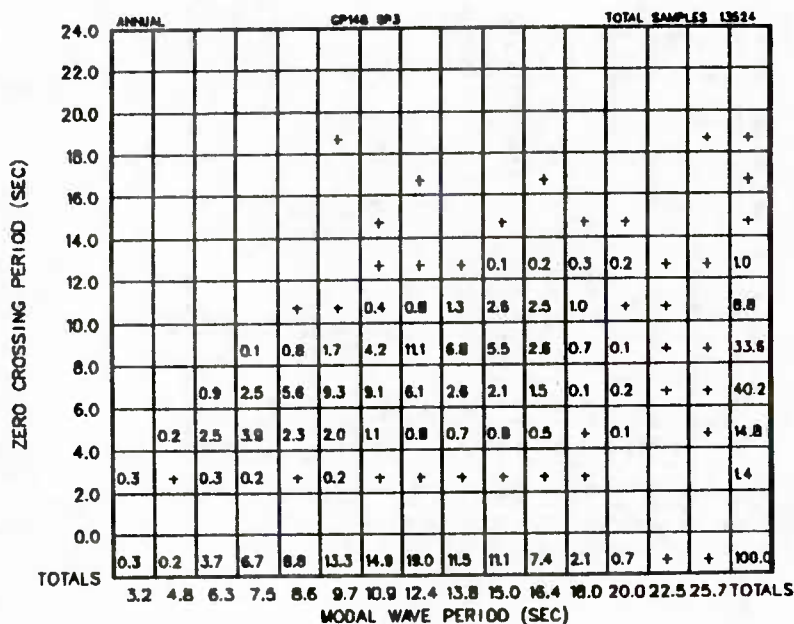


Figure A-148-1-8 Zero Crossing Period vs. Modal Wave Period

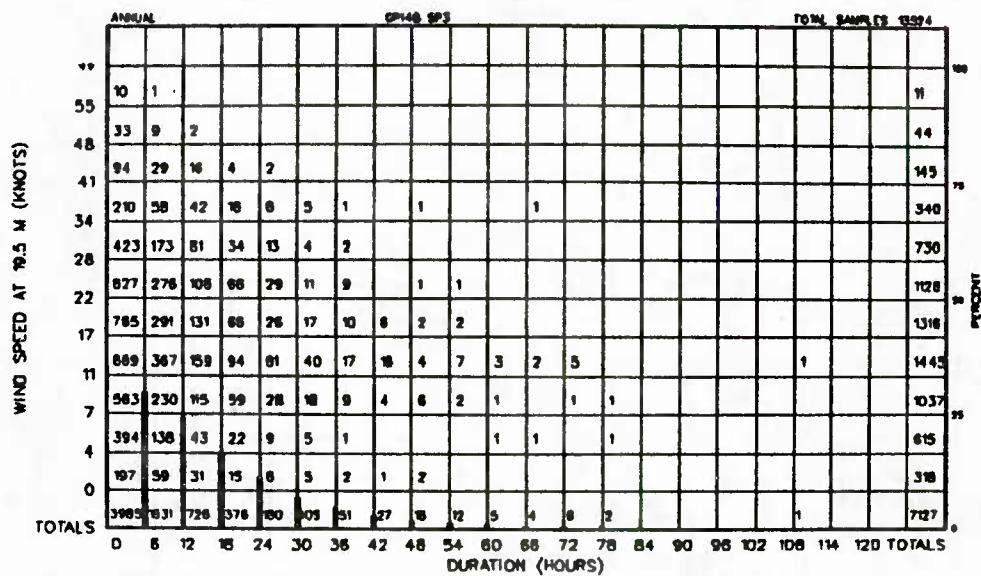


Figure A-148-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

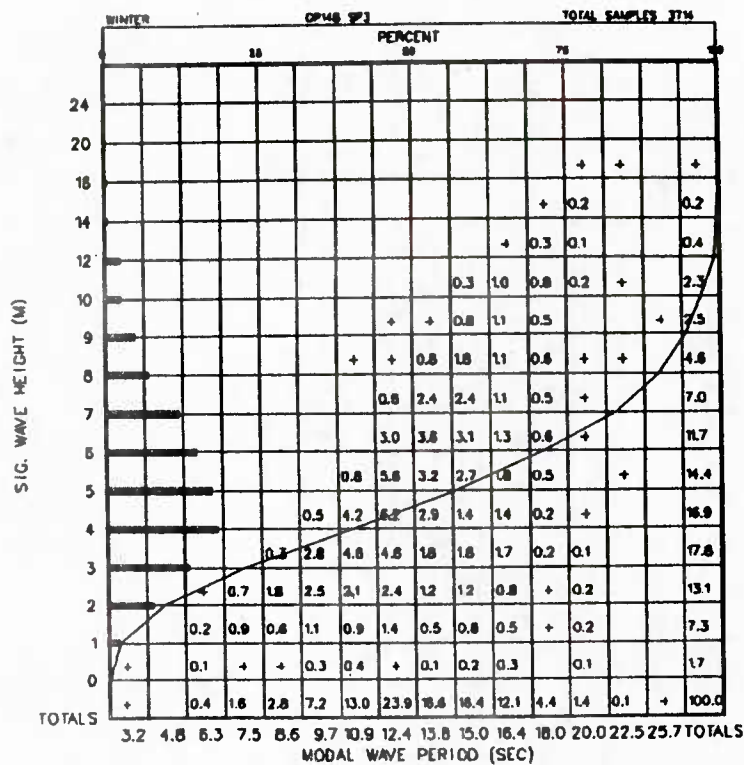


Figure A-148-2-1 Significant Wave Height vs. Modal Wave Period

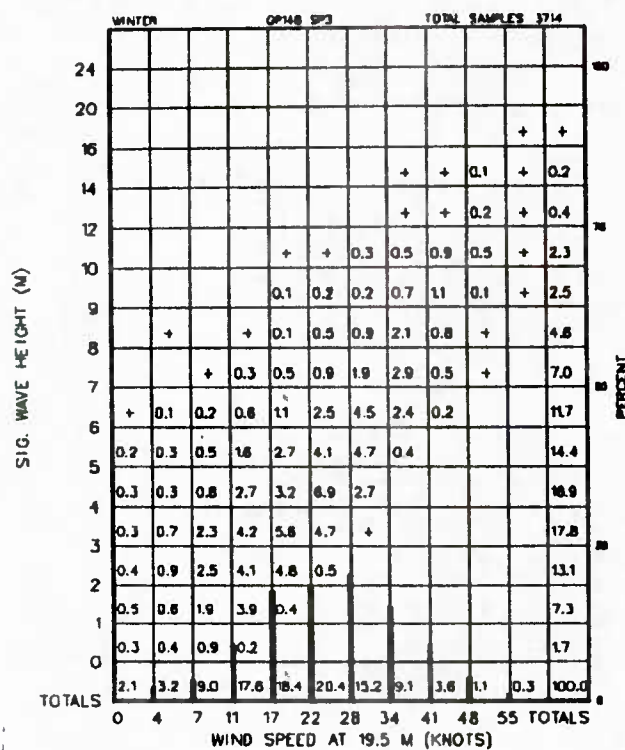


Figure A-148-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

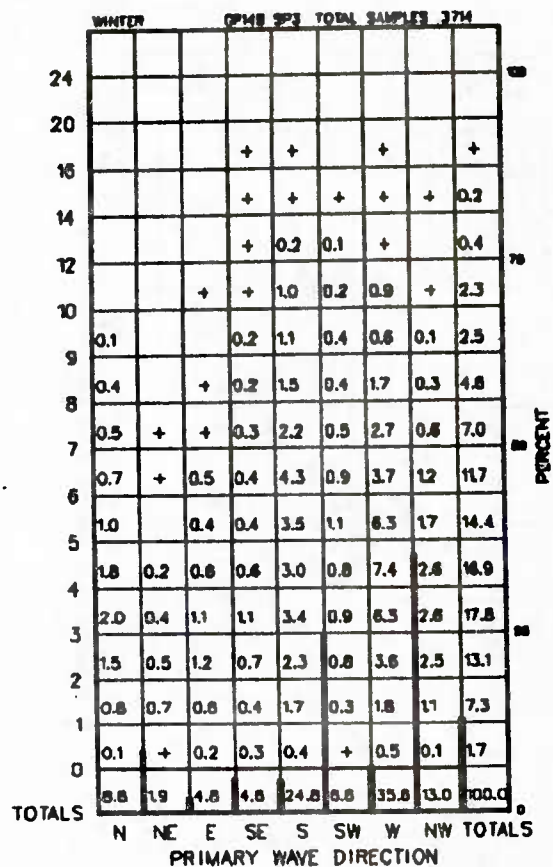


Figure A-148-2-3 Significant Wave Height vs. Primary Wave Direction

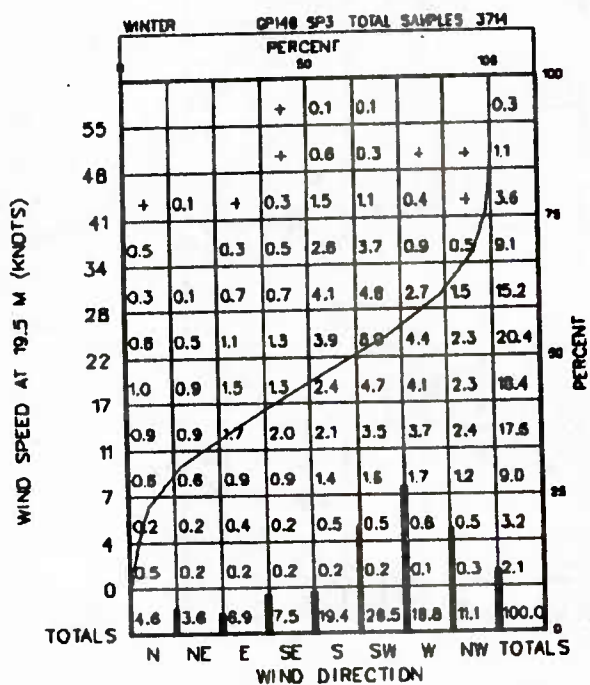


Figure A-148-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

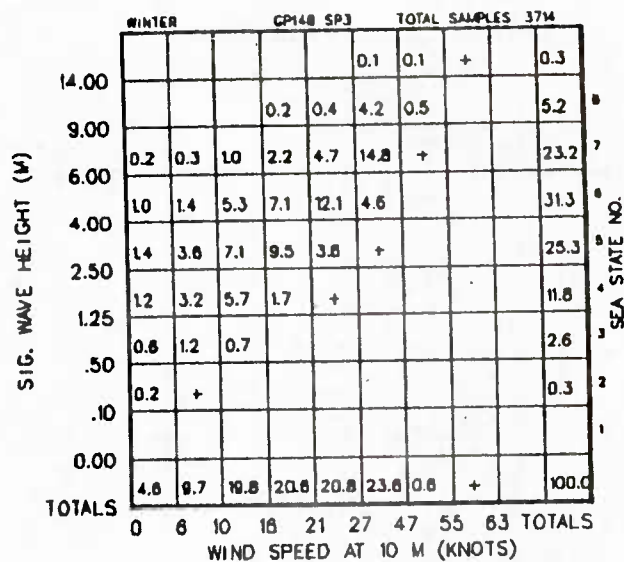


Figure A-148-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

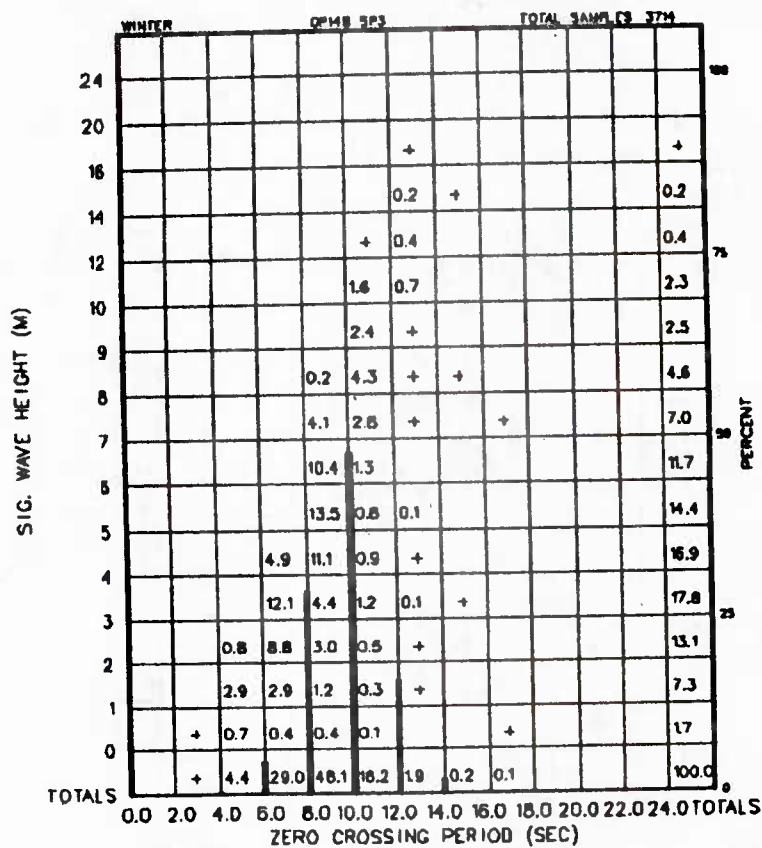


Figure A-148-2-6 Significant Wave Height vs. Zero Crossing Period

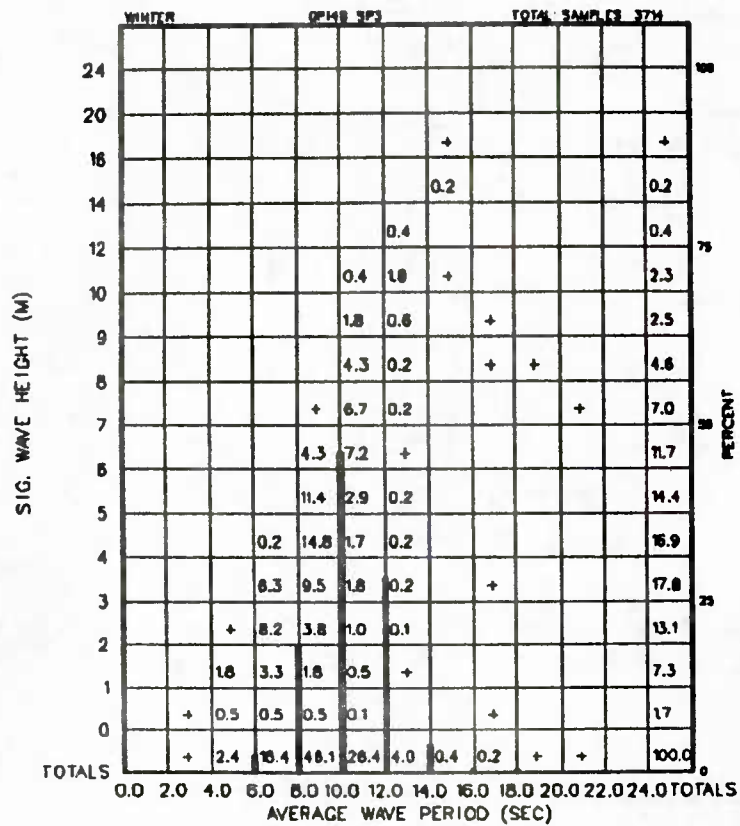


Figure A-148-2-7 Significant Wave Height vs. Average Wave Period

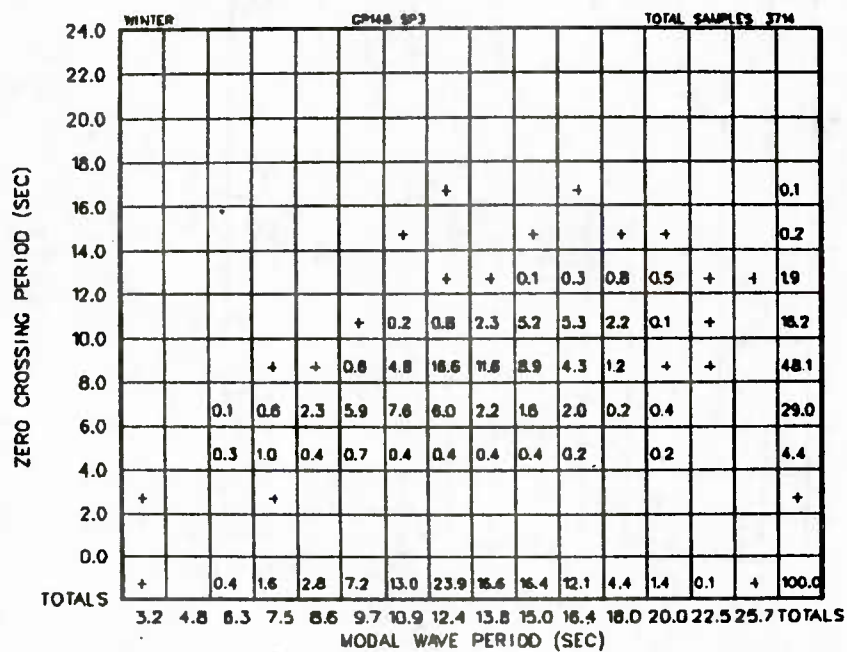


Figure A-148-2-8 Zero Crossing Period vs. Modal Wave Period

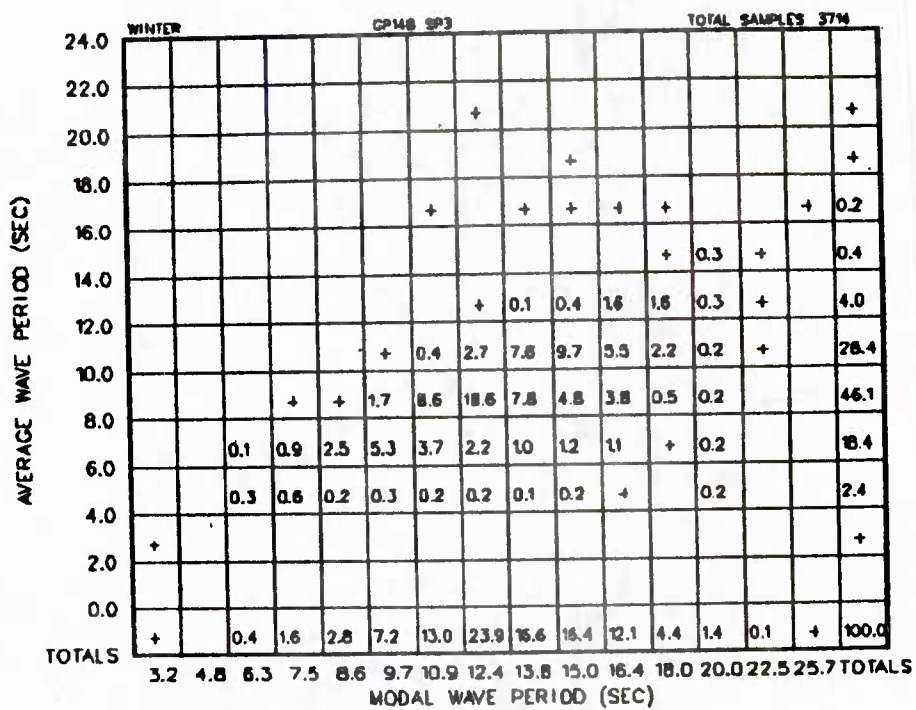


Figure A-148-2-9 Average Wave Period vs.
Modal Wave Period

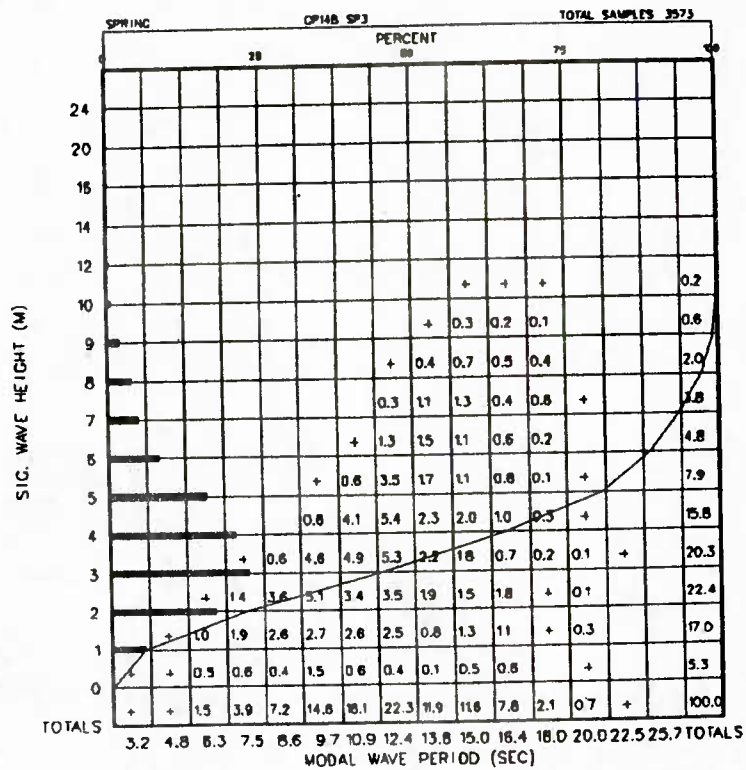


Figure A-148-3-1 Significant Wave Height vs. Modal Wave Period

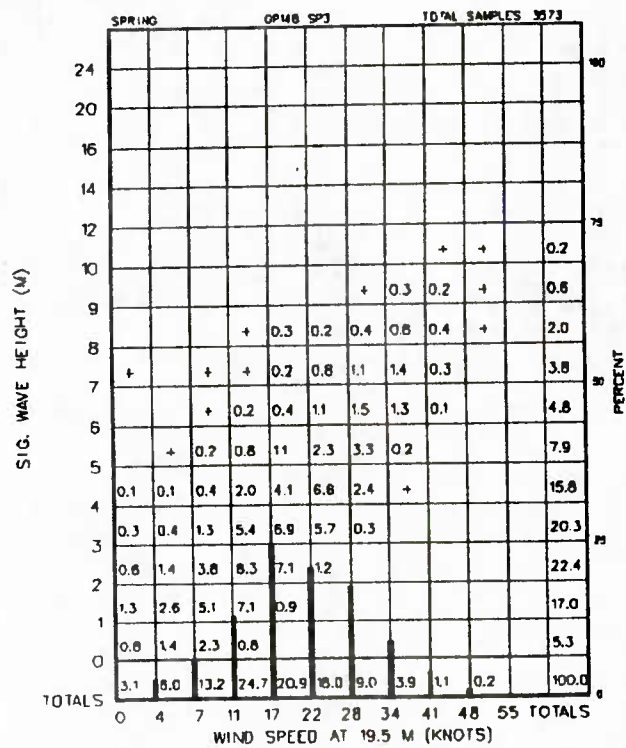


Figure A-148-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

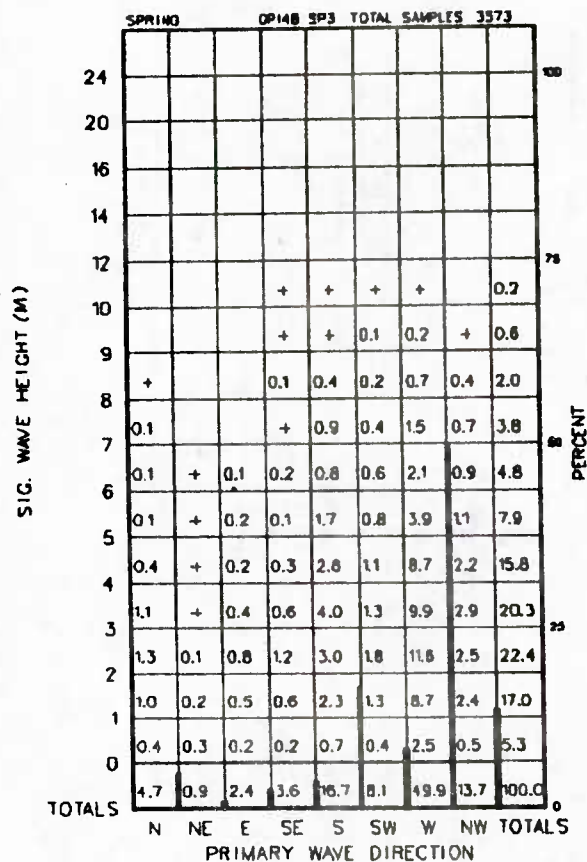


Figure A-148-3-3 Significant Wave Height vs. Primary Wave Direction

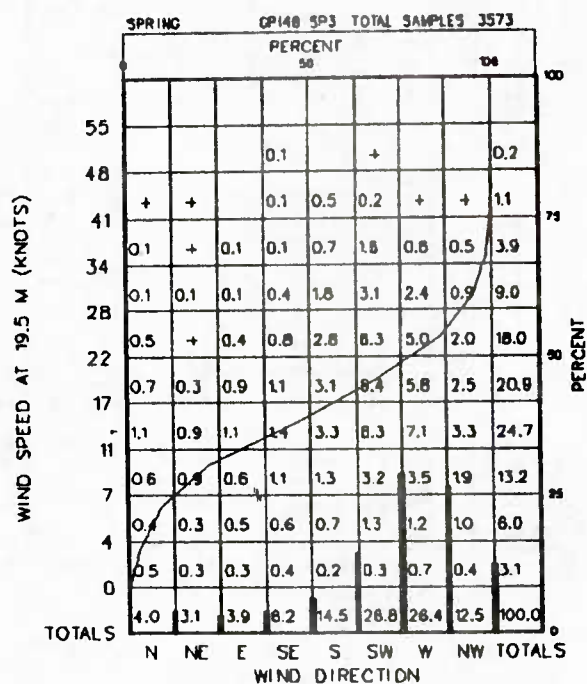


Figure A-148-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

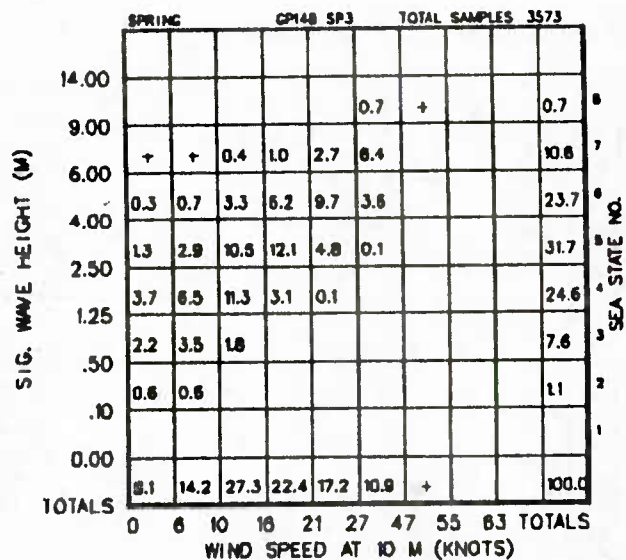


Figure A-148-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

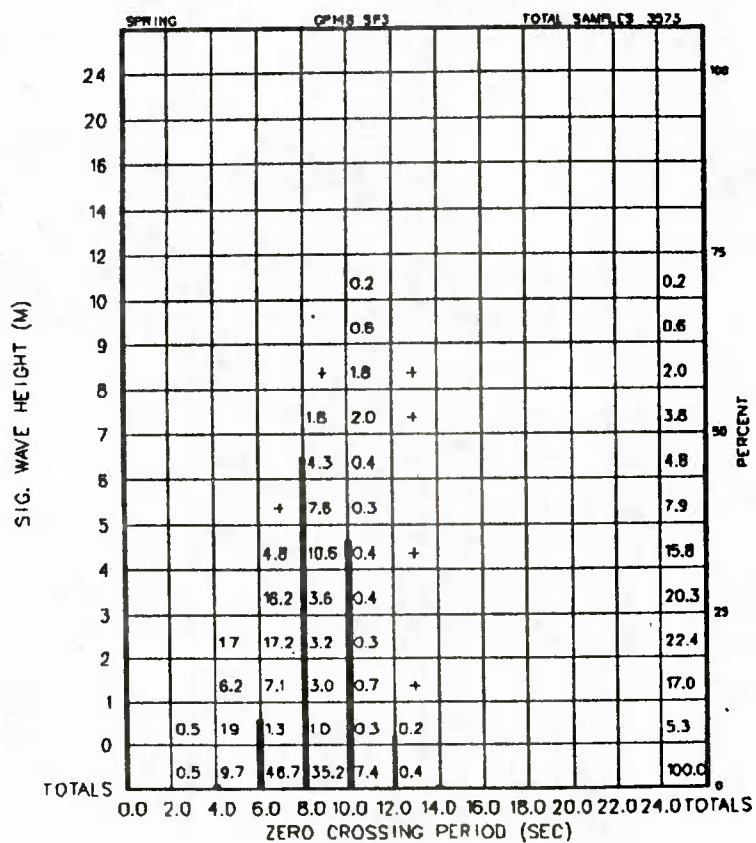


Figure A-148-3-6 Significant Wave Height vs. Zero Crossing Period

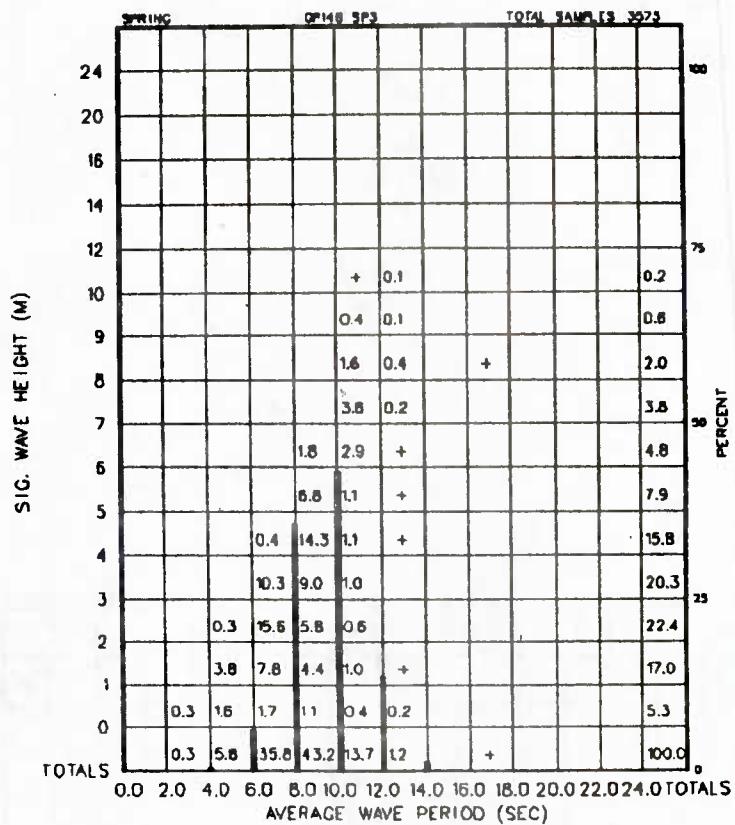


Figure A-148-3-7 Significant Wave Height vs.
Average Wave Period

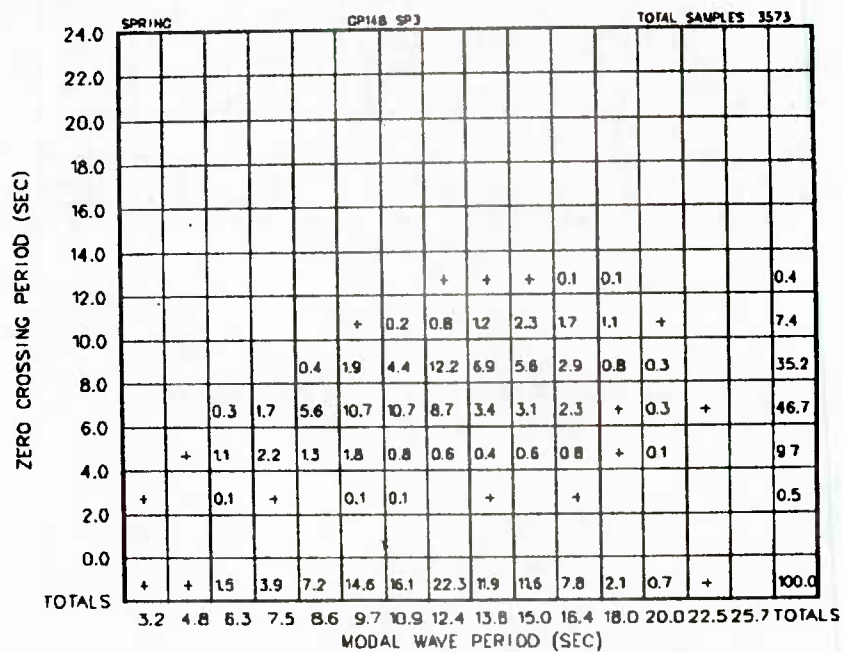


Figure A-148-3-8 Zero Crossing Period vs.
Modal Wave Period



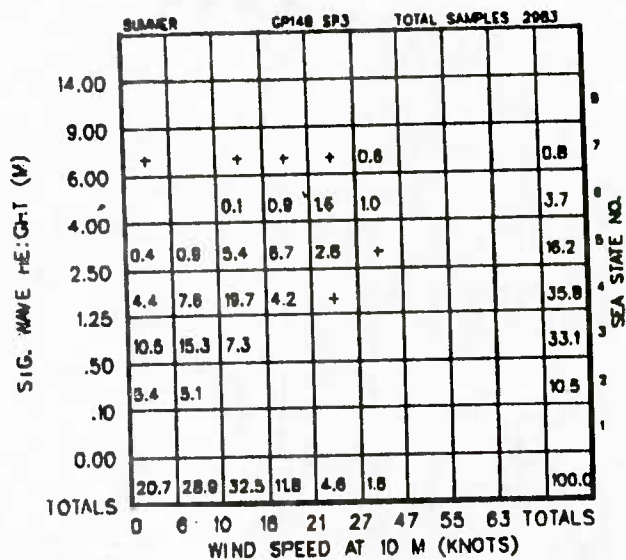


Figure A-148-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

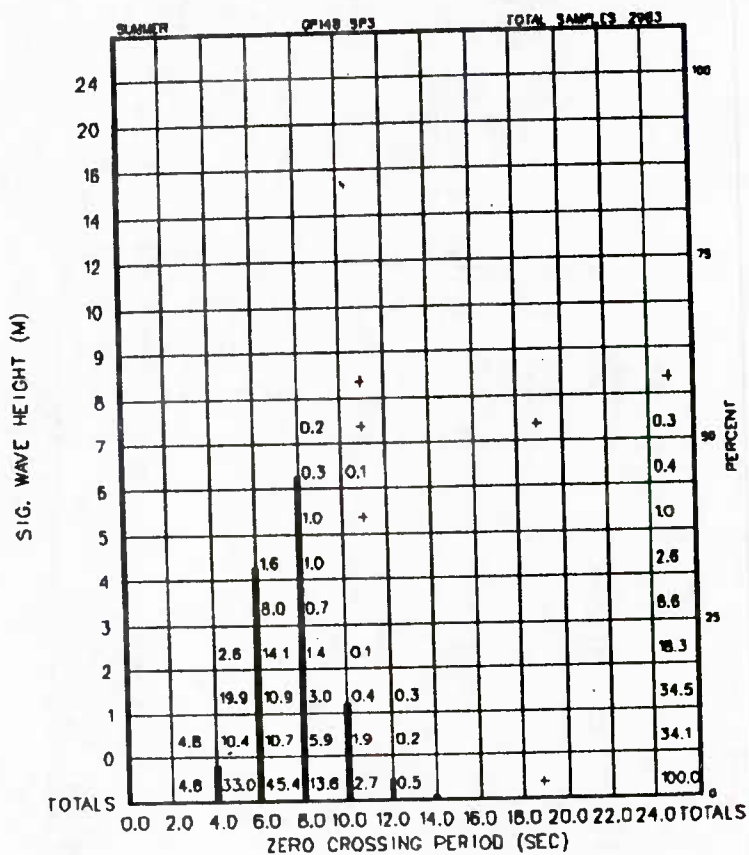


Figure A-148-4-6 Significant Wave Height vs. Zero Crossing Period

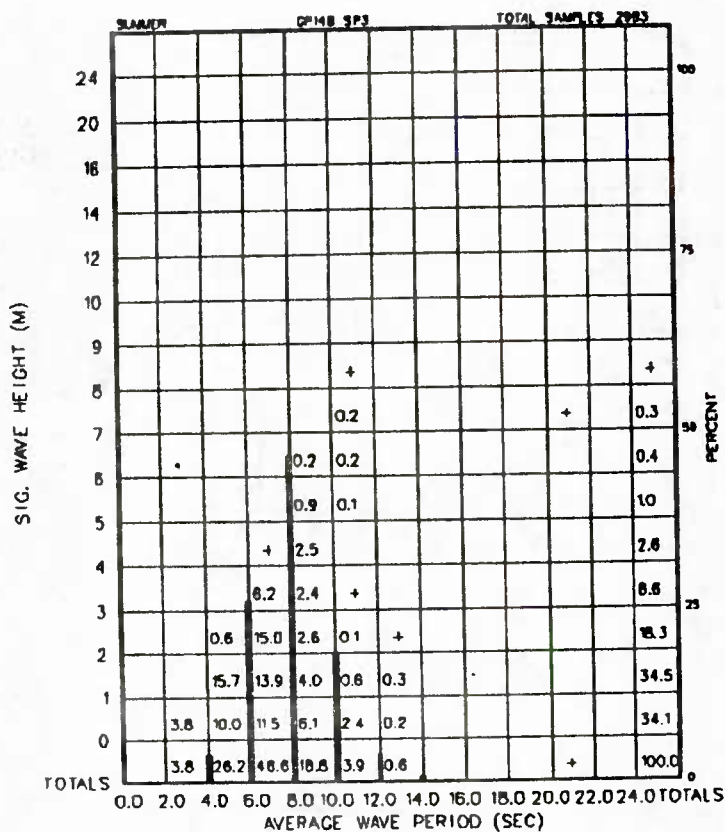


Figure A-148-4-7 Significant Wave Height vs. Average Wave Period

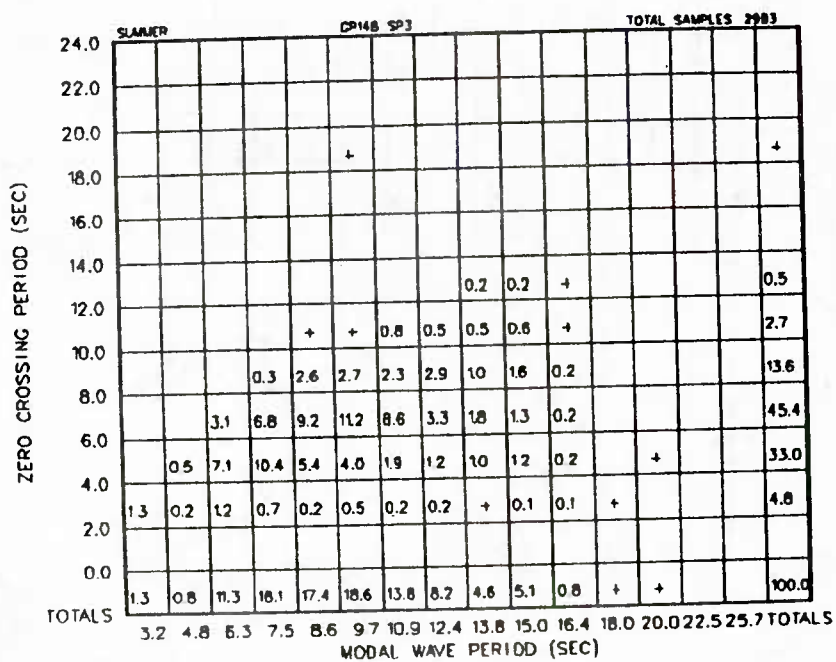


Figure A-148-4-8 Zero Crossing Period vs. Modal Wave Period

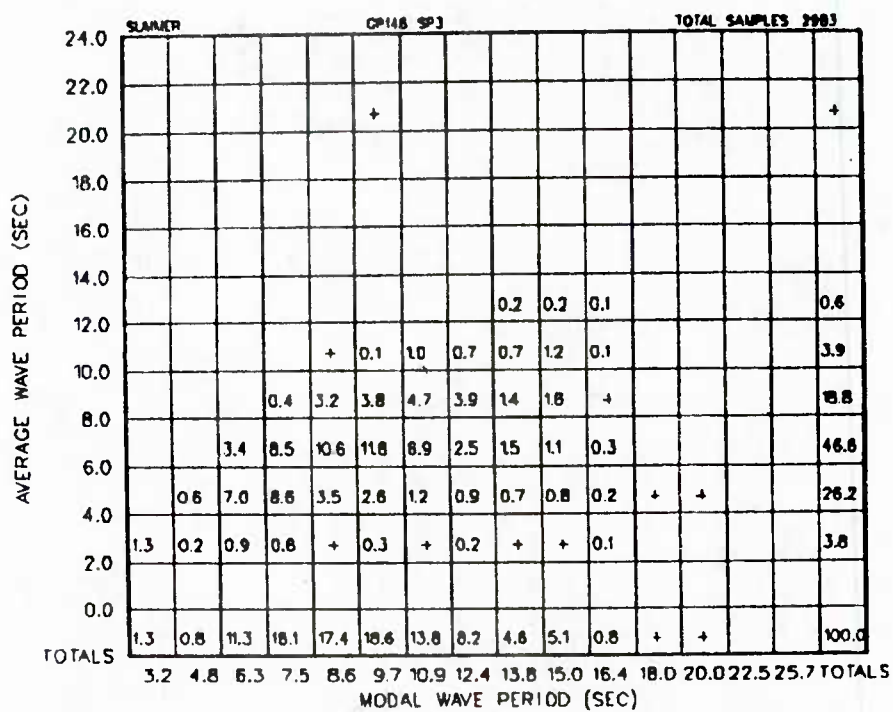


Figure A-148-4-9 Average Wave Period vs.
Modal Wave Period

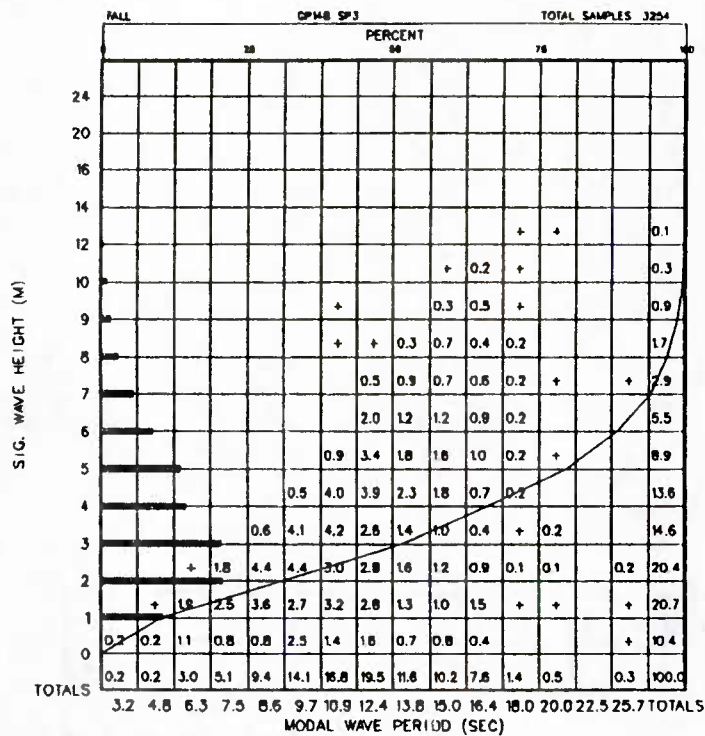


Figure A-148-5-1 Significant Wave Height vs. Modal Wave Period

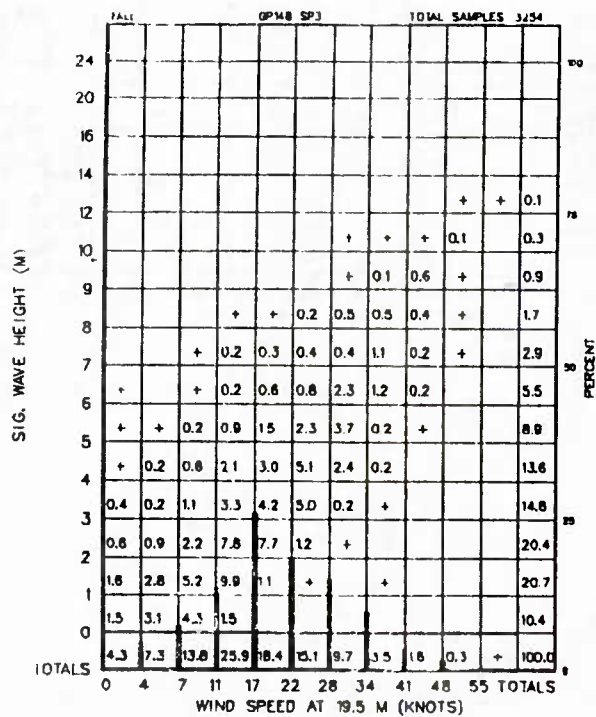


Figure A-148-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

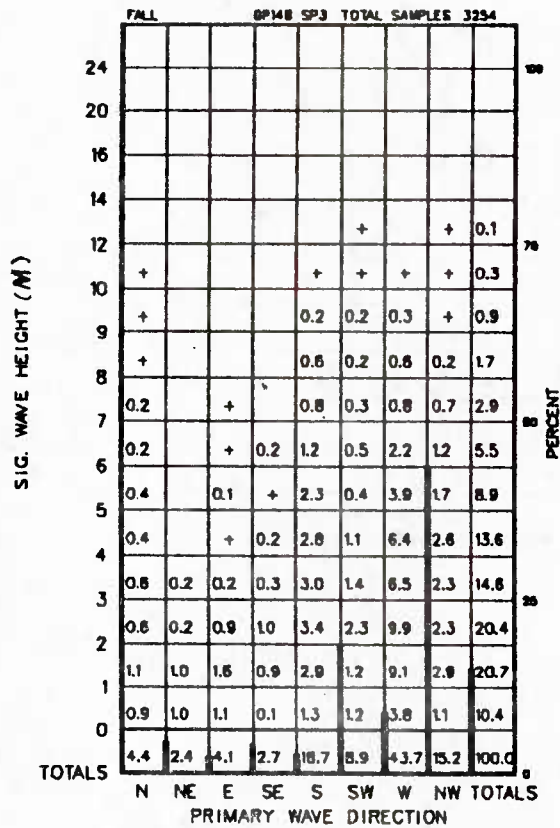


Figure A-148-5-3 Significant Wave Height vs. Primary Wave Direction

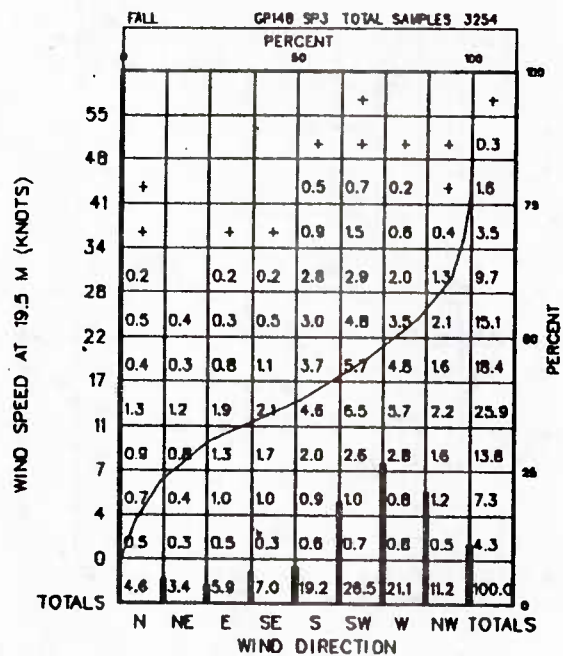


Figure A-148-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

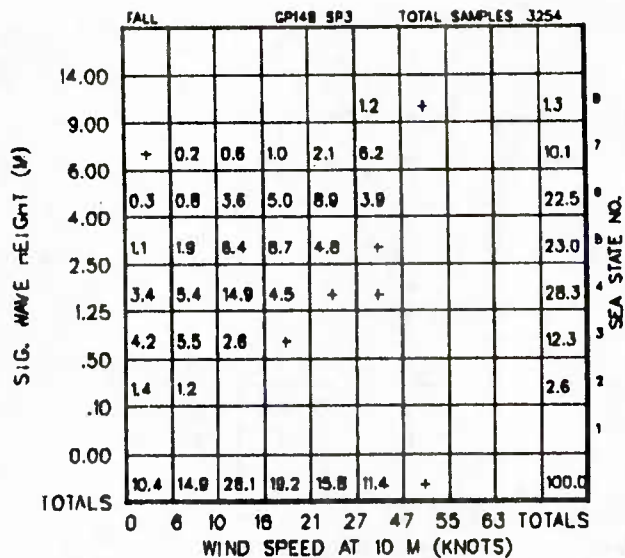


Figure A-148-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

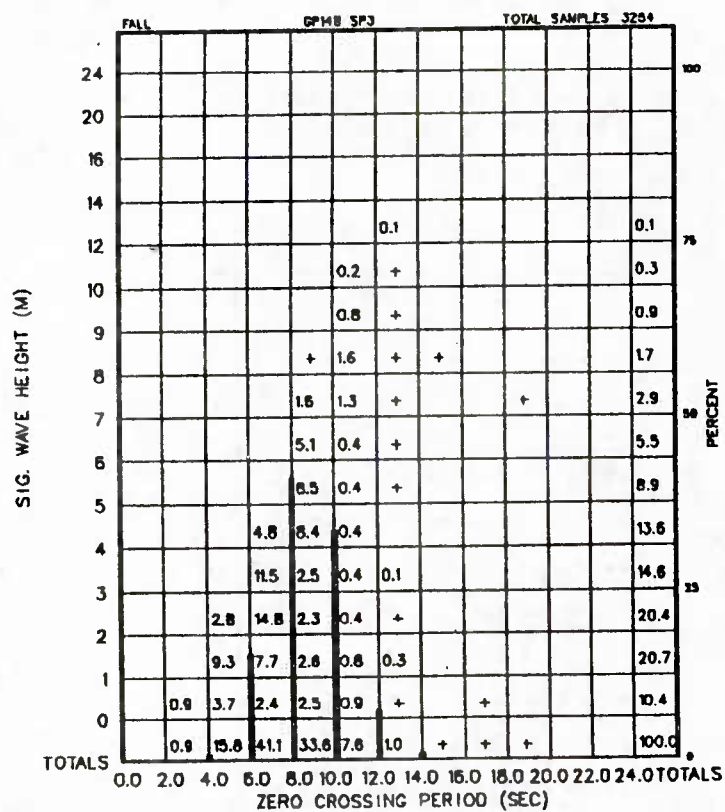


Figure A-148-5-6 Significant Wave Height vs. Zero Crossing Period

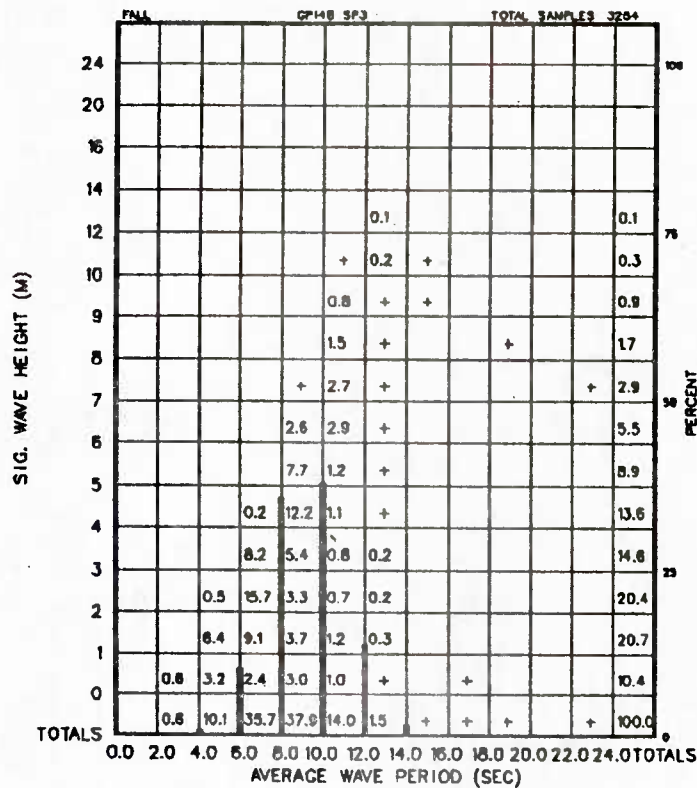


Figure A-148-5-7 Significant Wave Height vs. Average Wave Period

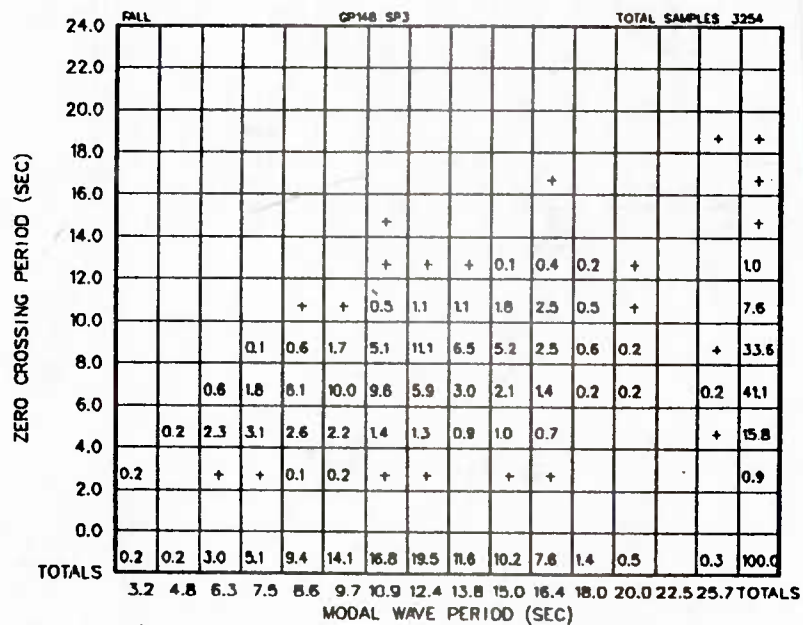


Figure A-148-5-8 Zero Crossing Period vs. Modal Wave Period



TABLE A-164-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 50.89°N, 145.65°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	1 7 -	3.5 12.4 -	8.5 18 -	4 12.25 -	2.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1.25 -	19 3 -	38 7.5 -	19.75 3.25 -	14 2.75 SW-W
Visibility, nautical miles	0.5	8	20	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0.5	7 6	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 21% of the time		Snow - 5% of the time (Dec-Mar)		
Relative Humidity, %	70	88	98	-	-
Air Temperature, °C	4.5	6.5	9	6.5	-
Sea Surface Temperature, °C	6.5	8.5	11	-	-
Sea Level Pressure, millibars	990	1012	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refractivity (1 km, Annual) Super-Refractivity or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 3% 2%

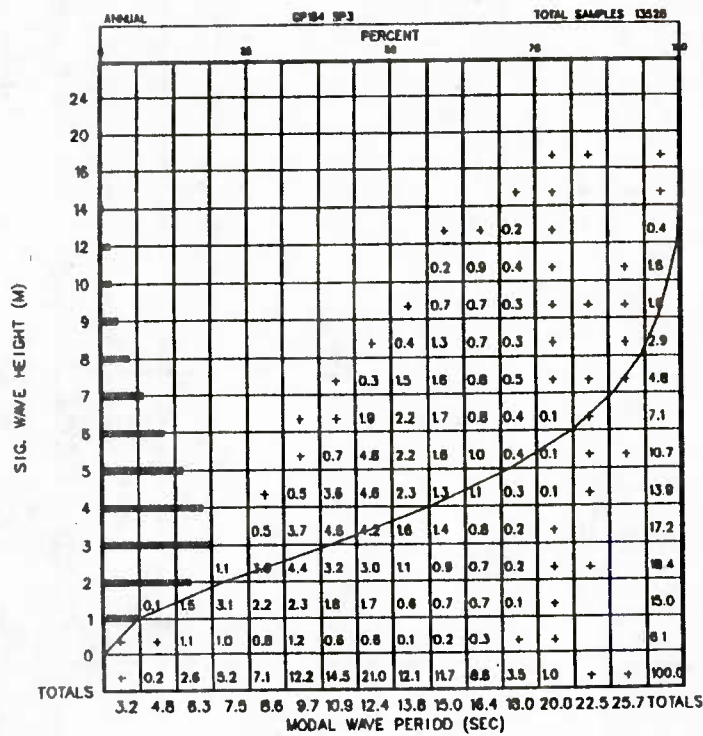


Figure A-164-1-1 Significant Wave Height vs. Modal Wave Period

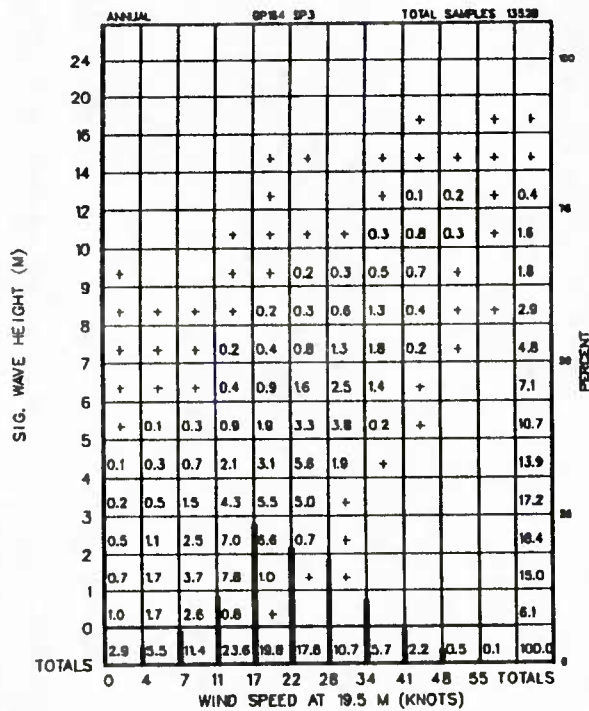


Figure A-164-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

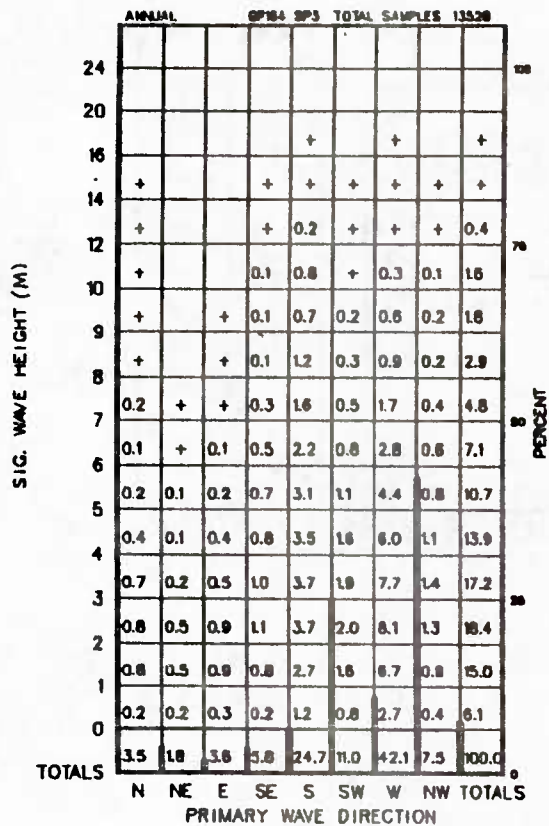


Figure A-164-1-3 Significant Wave Height vs. Primary Wave Direction

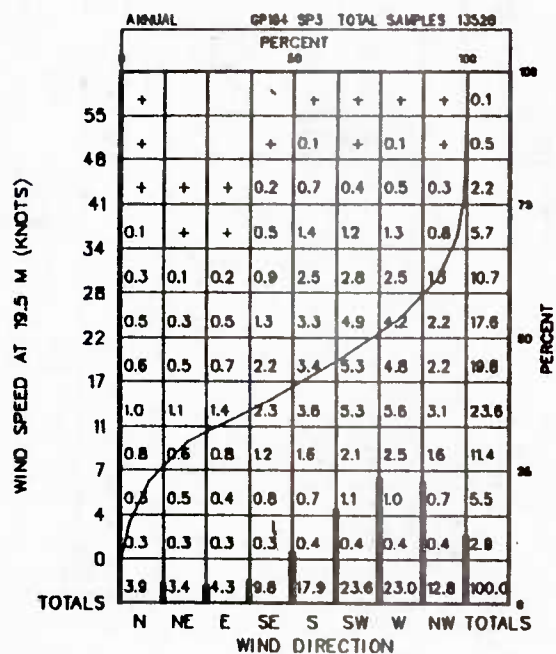


Figure A-164-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

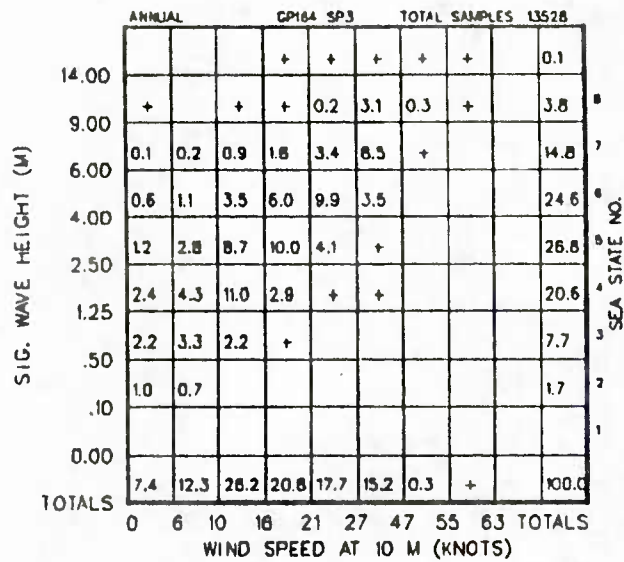


Figure A-164-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

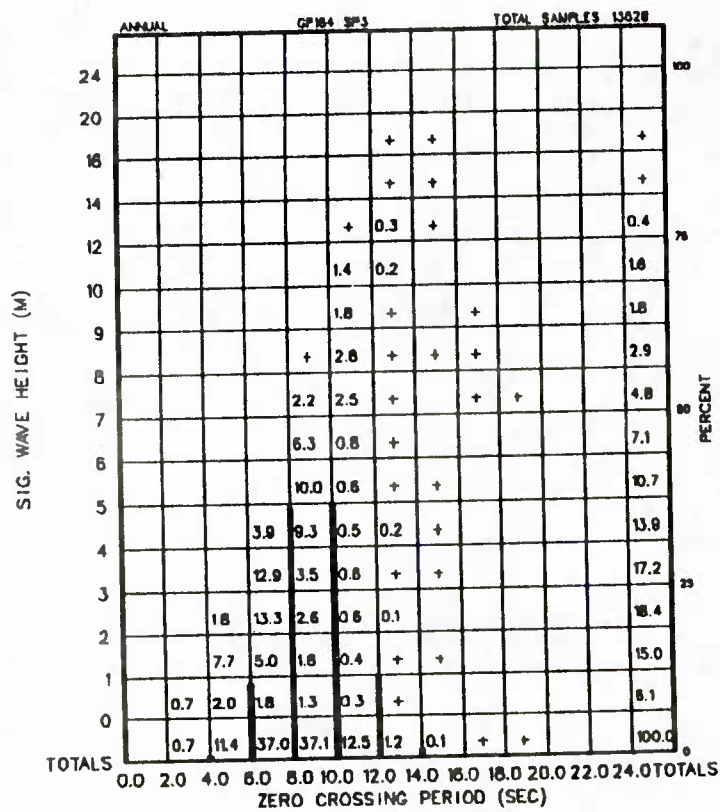


Figure A-164-1-6 Significant Wave Height vs. Zero Crossing Period

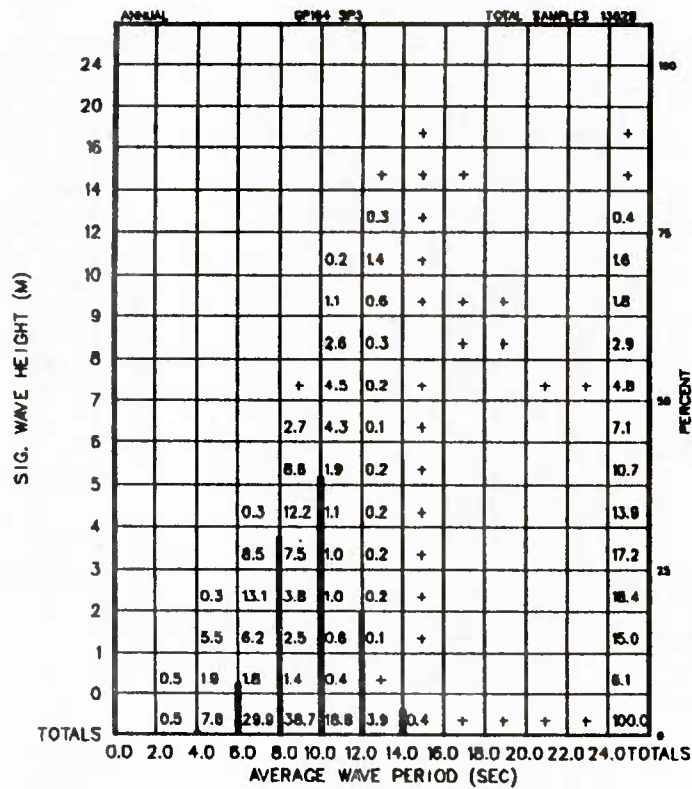


Figure A-164-1-7 Significant Wave Height vs. Average Wave Period

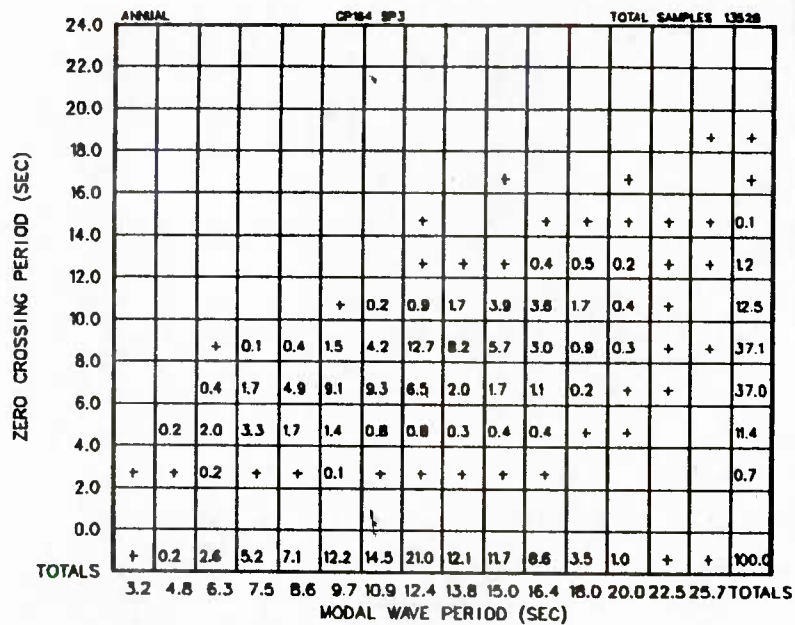


Figure A-164-1-8 Zero Crossing Period vs. Modal Wave Period

		ANNUAL												CP164 SP3												TOTAL SAMPLES 13528													
WIND SPEED AT 19.5 M (KNOTS)																																						PERCENT	
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS																
44	10	2	2																					14															
55	38	9	4	1																				52															
48	119	49	20	3	1			1																193															
41	274	112	52	13	5	2	2	1																481															
34	490	198	89	37	15	10	1	1																839															
28	737	283	149	68	32	10	10	3	2	1	1													1290															
22	854	322	165	83	37	18	6	8	1	1		1			1									1475															
17	728	332	168	82	54	29	12	15	8	4	5	3	2	1	2									1483															
11	524	202	97	33	15	8	4	1	2		1													887															
7	334	109	32	10	7	4																		498															
4	154	54	19	10	3	2																		242															
0																																							
TOTALS	4282	1670	815	320	169	81	38	29	13	8	7	4	2	2	2									7418															
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS																

Figure A-164-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

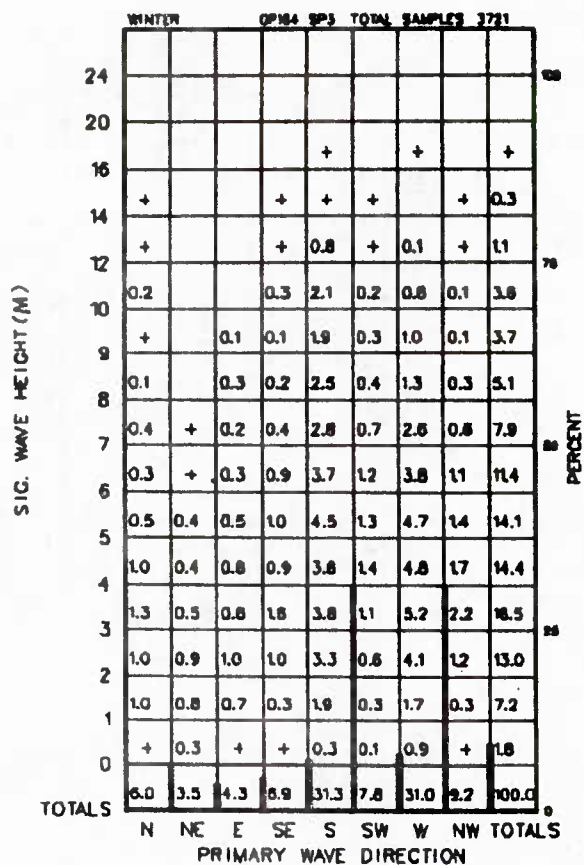


Figure A-164-2-3 Significant Wave Height vs. Primary Wave Direction

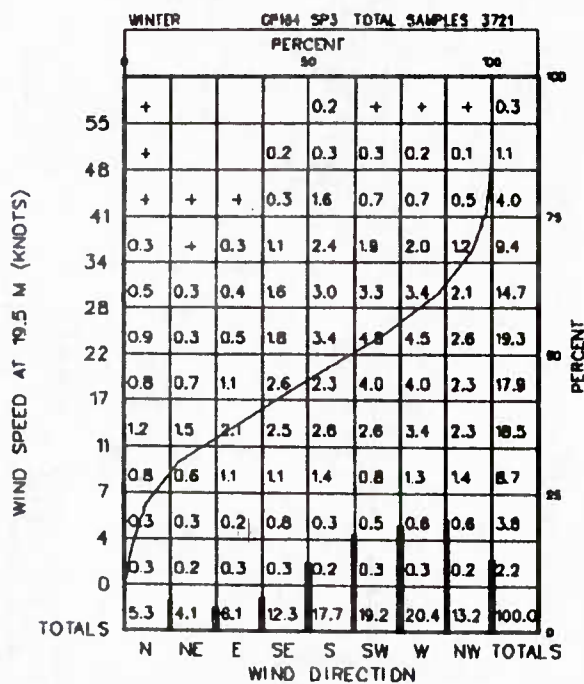
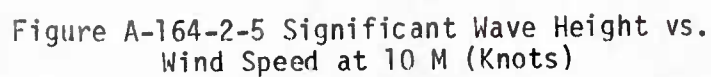


Figure A-164-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



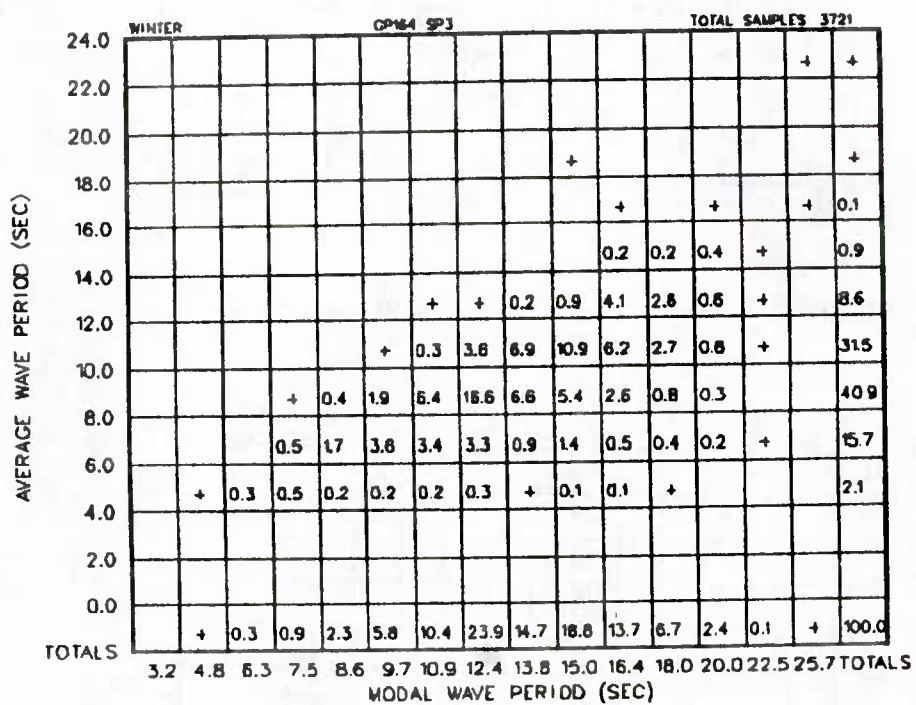


Figure A-164-2-9 Average Wave Period vs.
Modal Wave Period

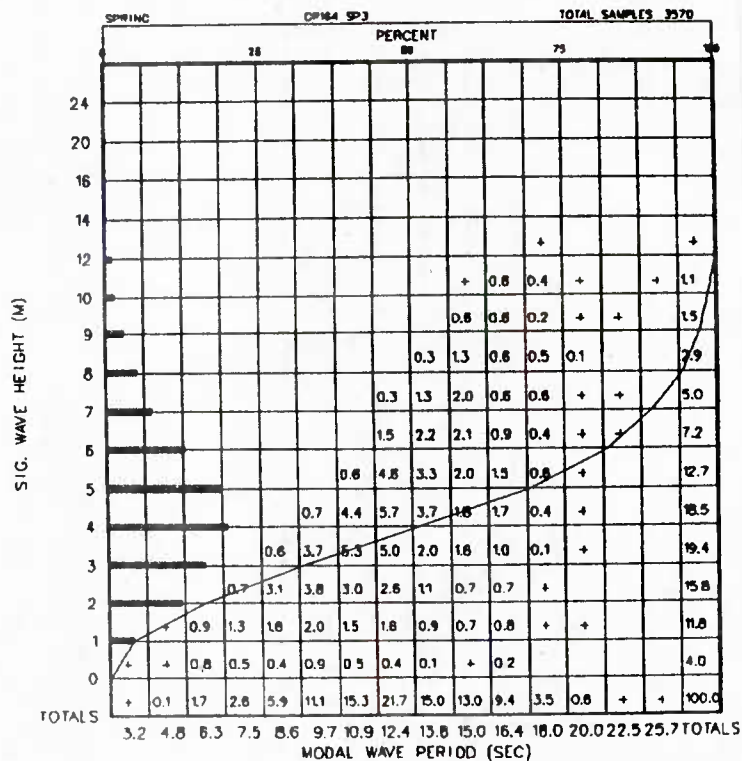


Figure A-164-3-1 Significant Wave Height vs. Modal Wave Period

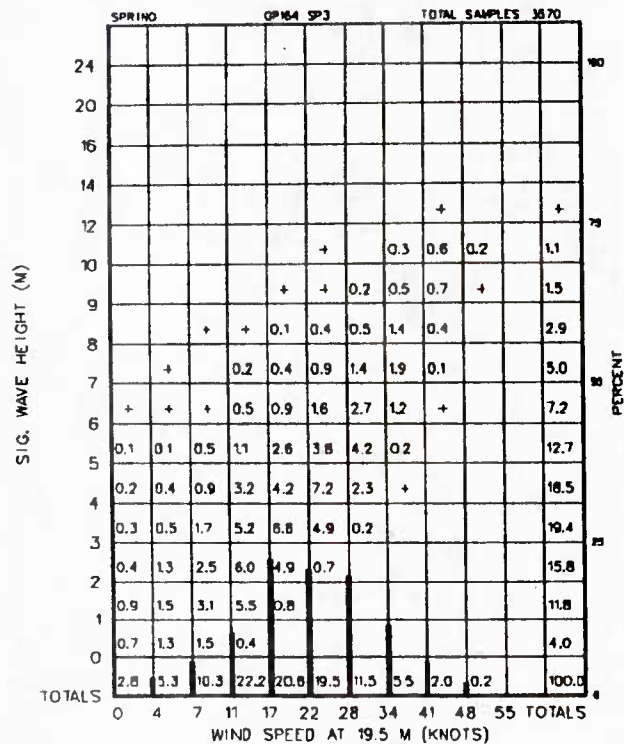


Figure A-164-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

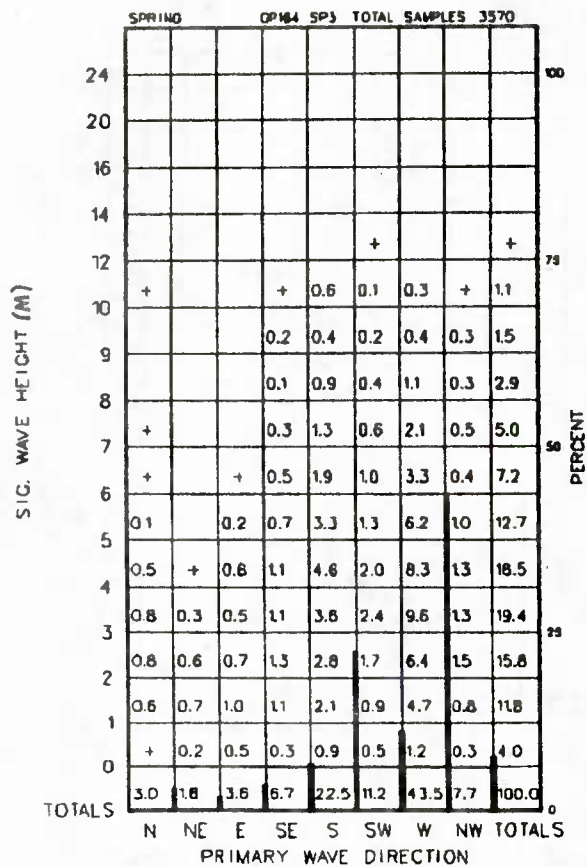


Figure A-164-3-3 Significant Wave Height vs. Primary Wave Direction

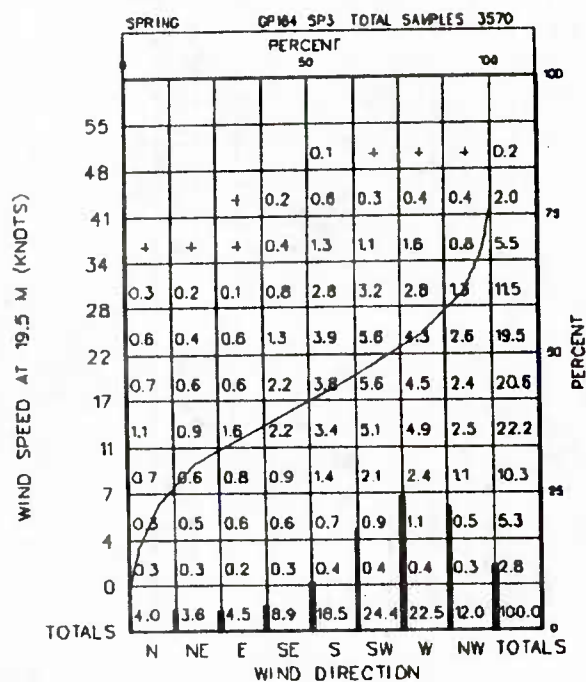
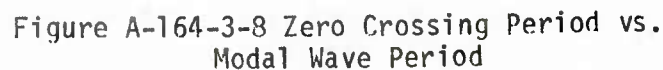
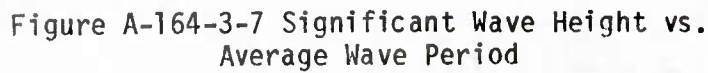


Figure A-164-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction







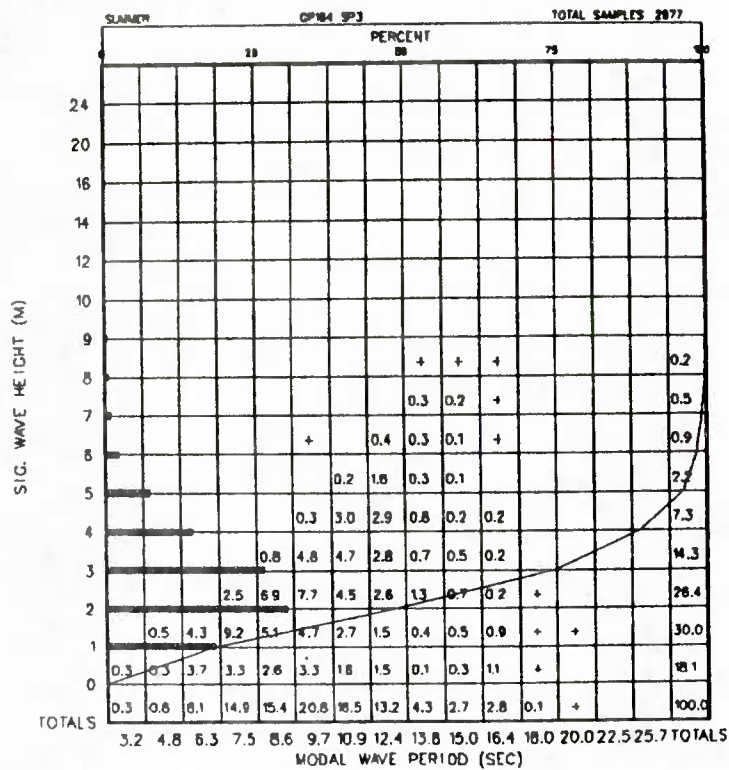


Figure A-164-4-1 Significant Wave Height vs. Modal Wave Period

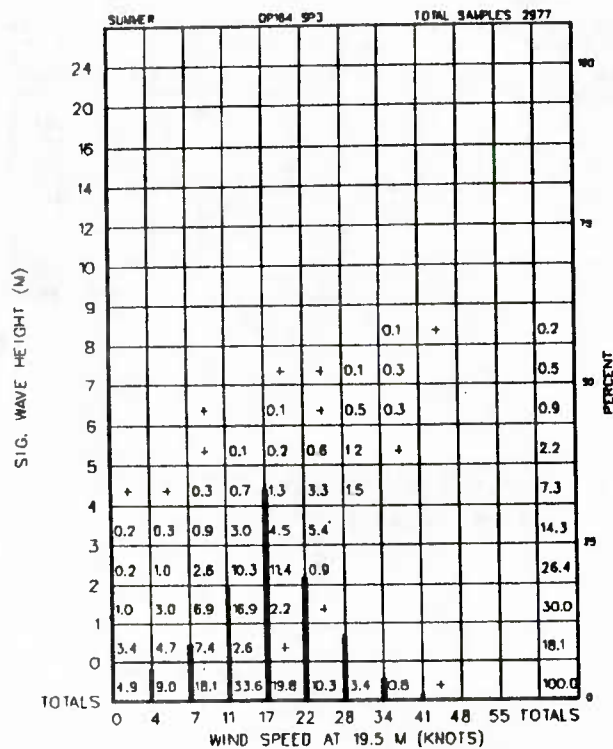


Figure A-164-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

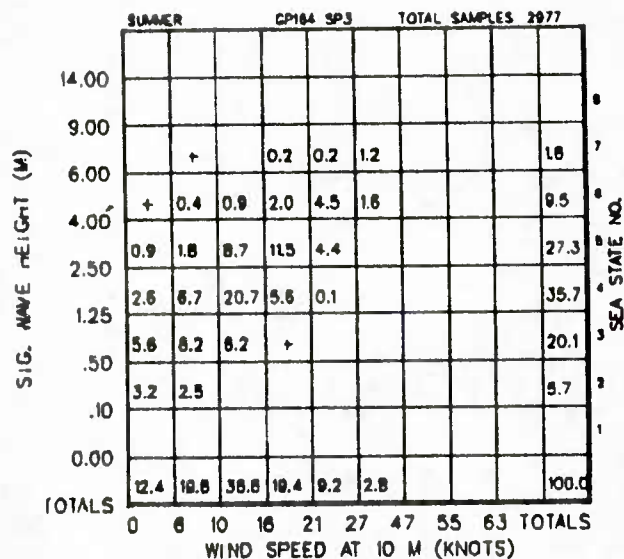


Figure A-164-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

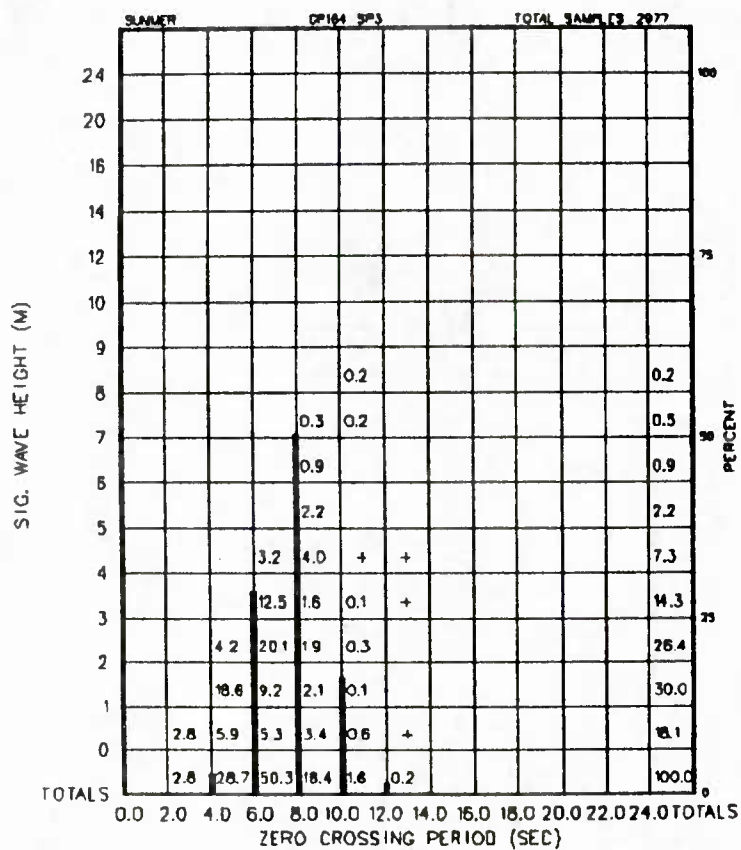


Figure A-164-4-5 Significant Wave Height vs. Zero Crossing Period

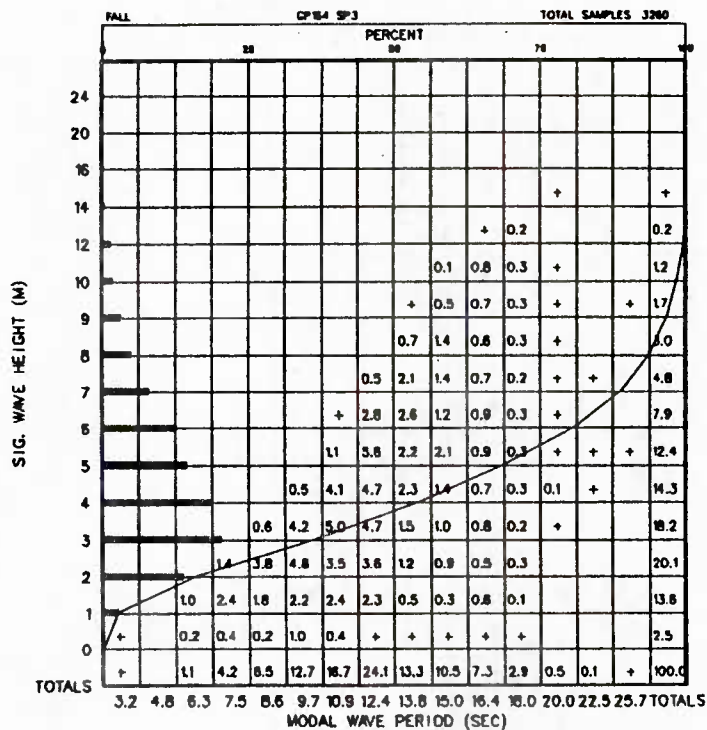


Figure A-164-5-1 Significant Wave Height vs. Modal Wave Period

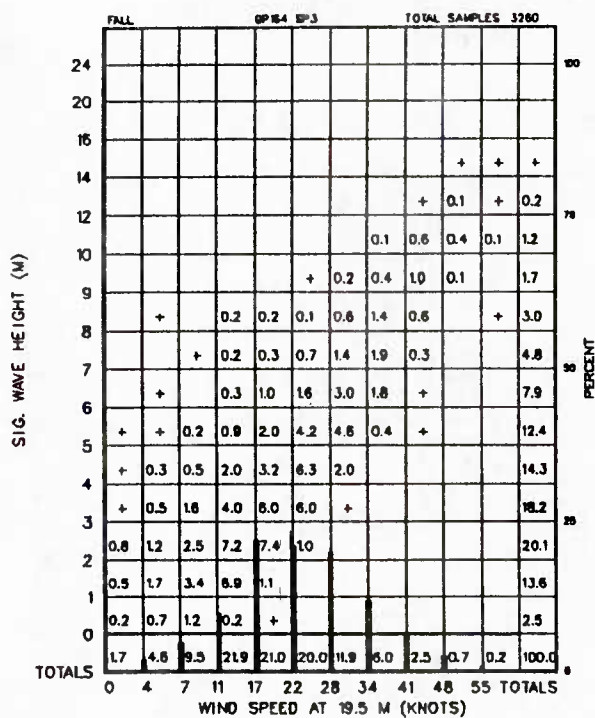


Figure A-164-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

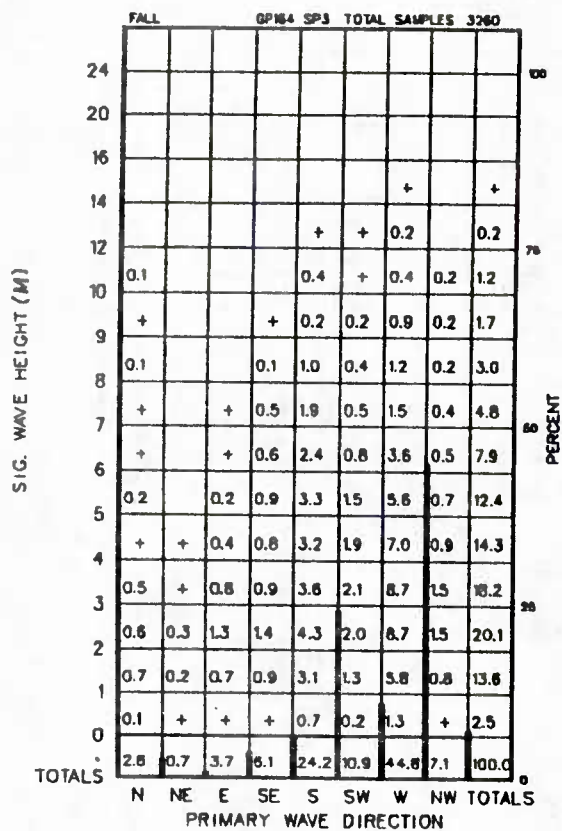


Figure A-164-5-3 Significant Wave Height vs. Primary Wave Direction

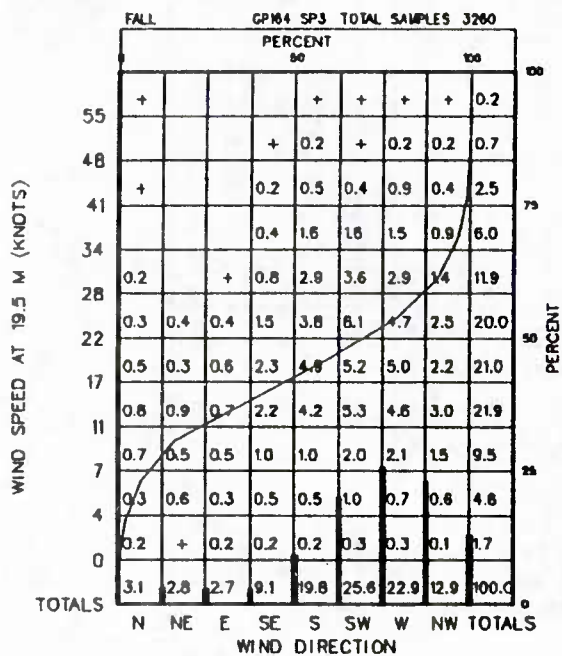


Figure A-164-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

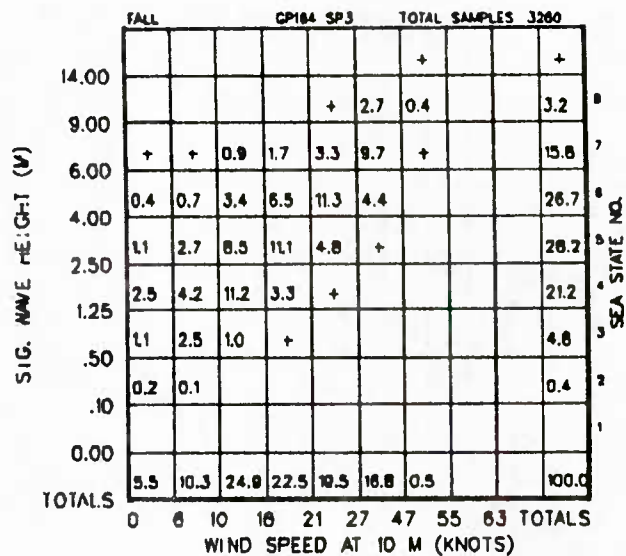


Figure A-164-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

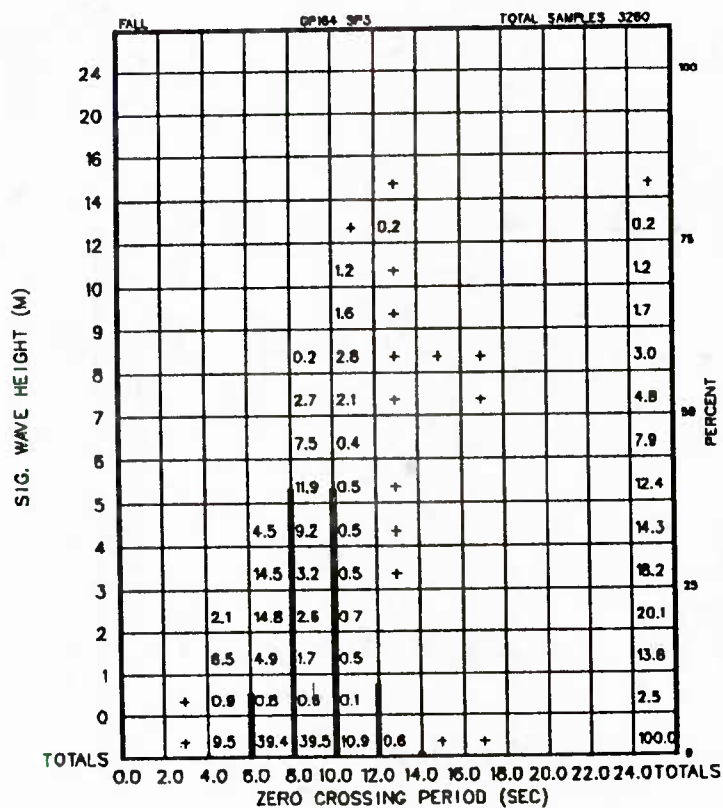


Figure A-164-5-6 Significant Wave Height vs. Zero Crossing Period

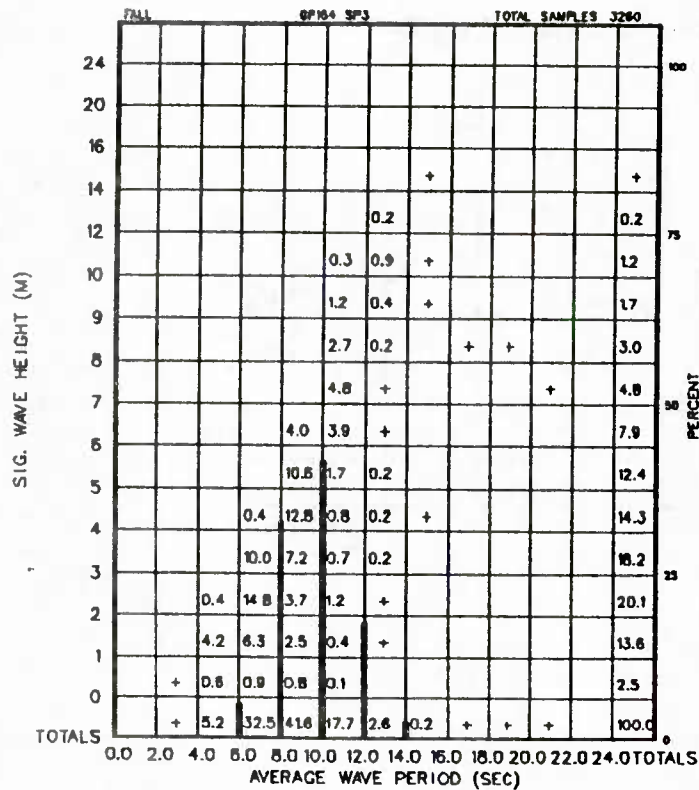


Figure A-164-5-7 Significant Wave Height vs. Average Wave Period

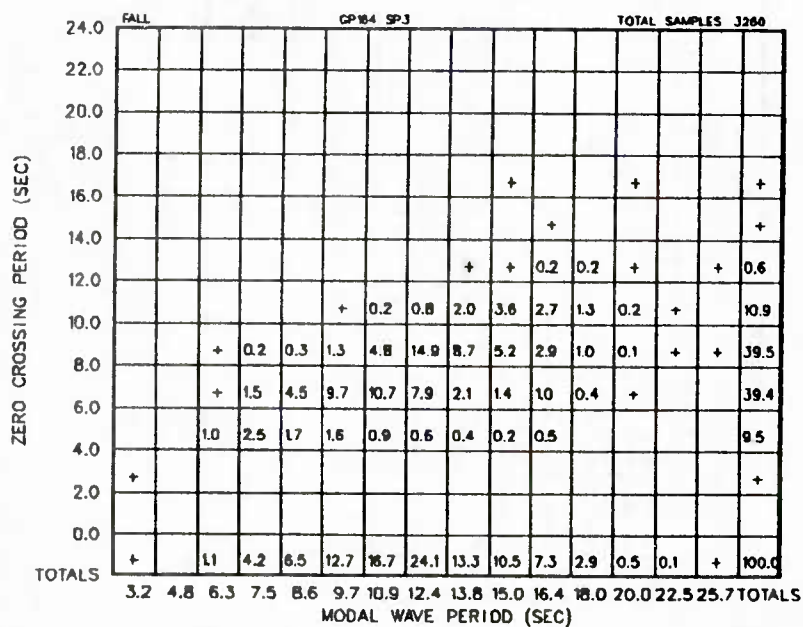


Figure A-164-5-8 Zero Crossing Period vs. Modal Wave Period

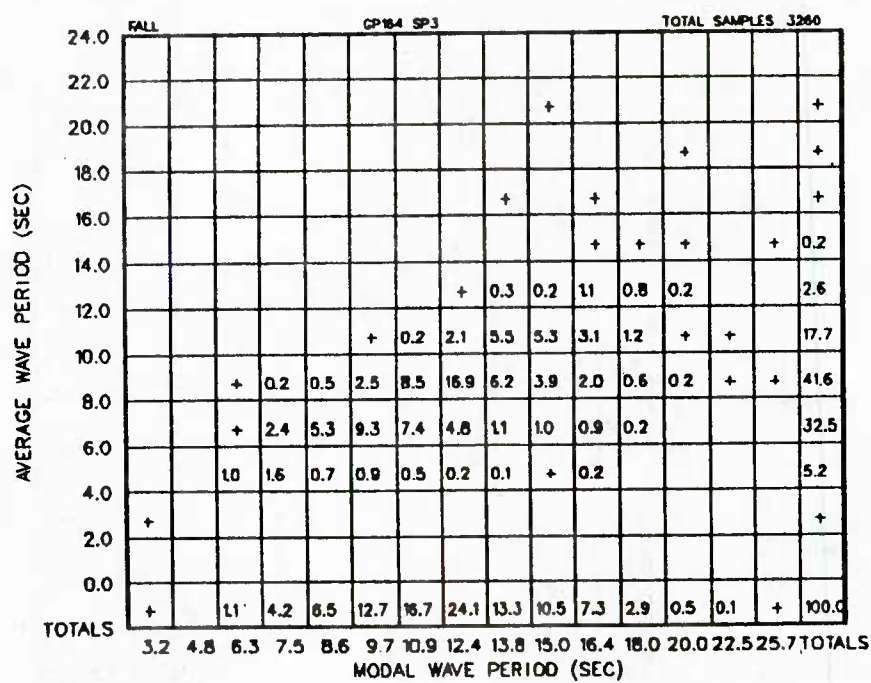


Figure A-164-5-9 Average Wave Period vs.
Modal Wave Period

TABLE A-188-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 36.16°N, 127.36°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	2.25 10 -	5 17 -	2.25 11.25 -	1.5 9.7 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	14 2 -	33 5 -	14 2 -	14 2 N-NW
Visibility, nautical miles	5	20	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	5.5 5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 6% of the time				
Relative Humidity, %	62	80	95	-	-
Air Temperature, °C	11.5	14	18	14	-
Sea Surface Temperature, °C	14	17	19.5	-	-
Sea Level Pressure, millibars	1008	1022	1030	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	343 - -	- 2% 6%

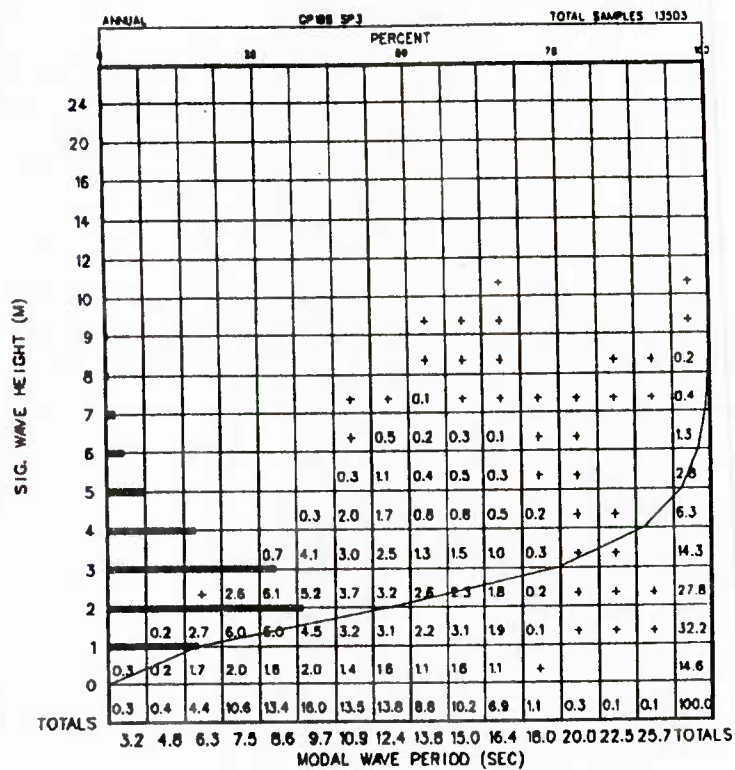


Figure A-188-1-1 Significant Wave Height vs. Modal Wave Period

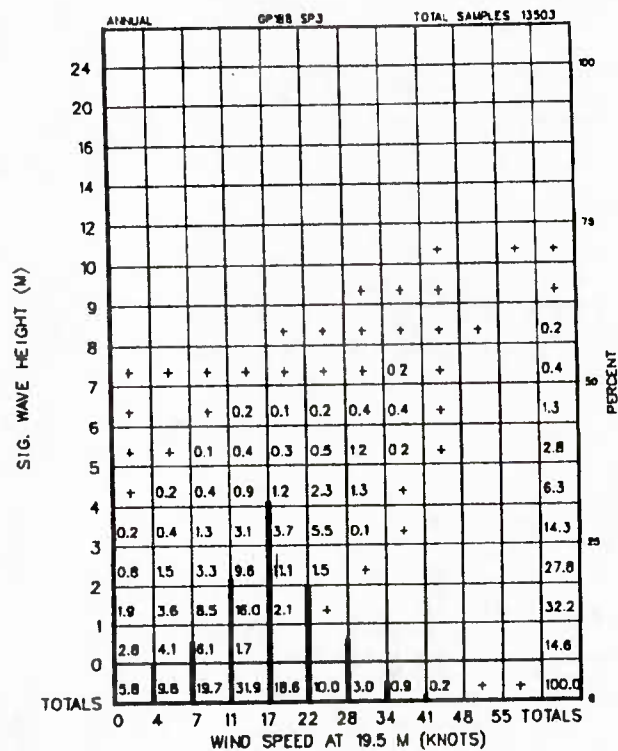


Figure A-188-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

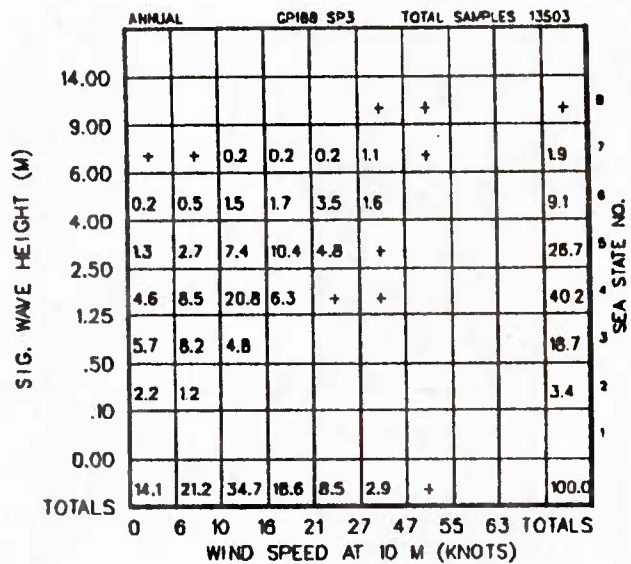


Figure A-188-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

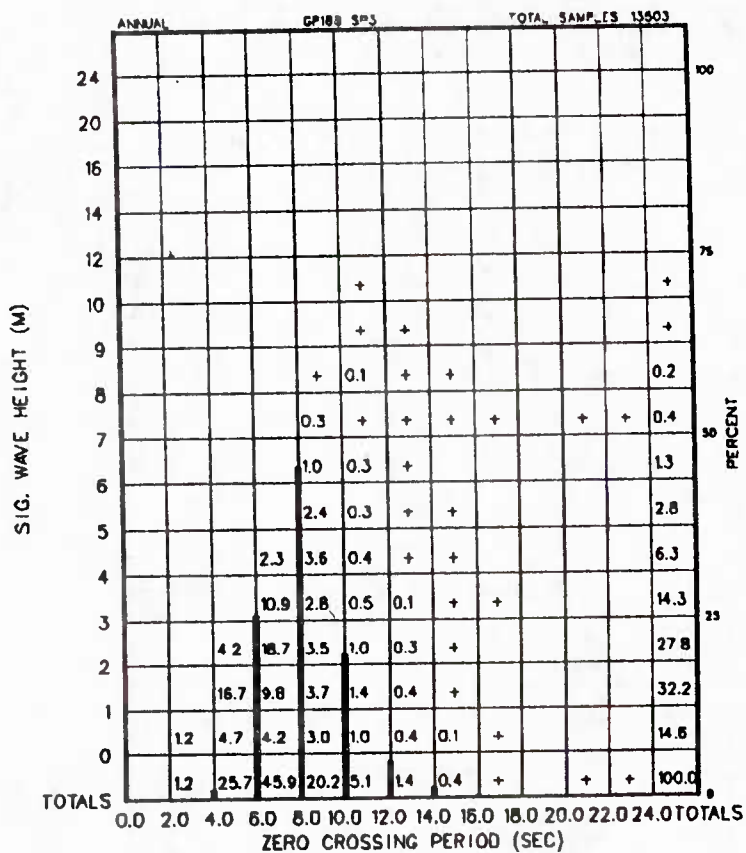
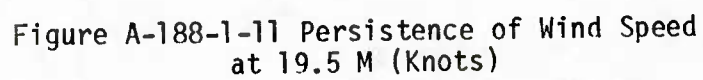


Figure A-188-1-6 Significant Wave Height vs. Zero Crossing Period



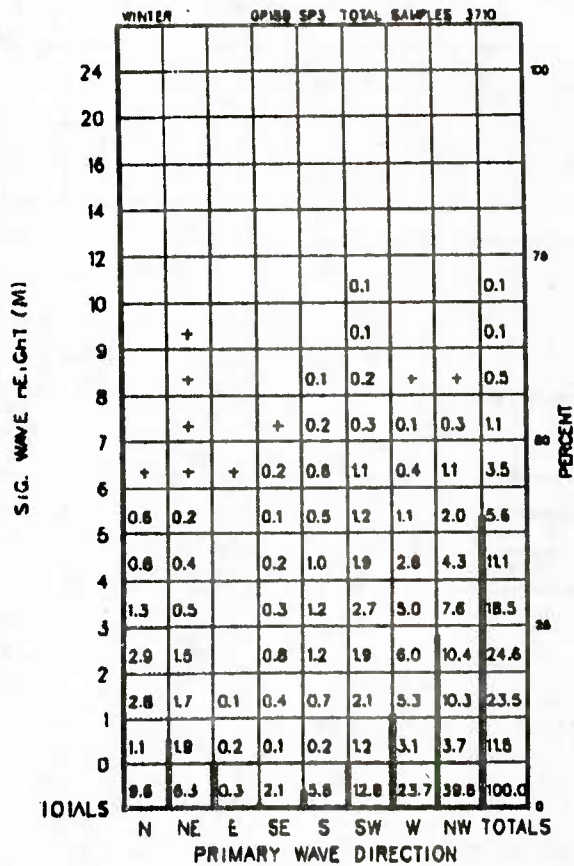


Figure A-188-2-3 Significant Wave Height vs. Primary Wave Direction

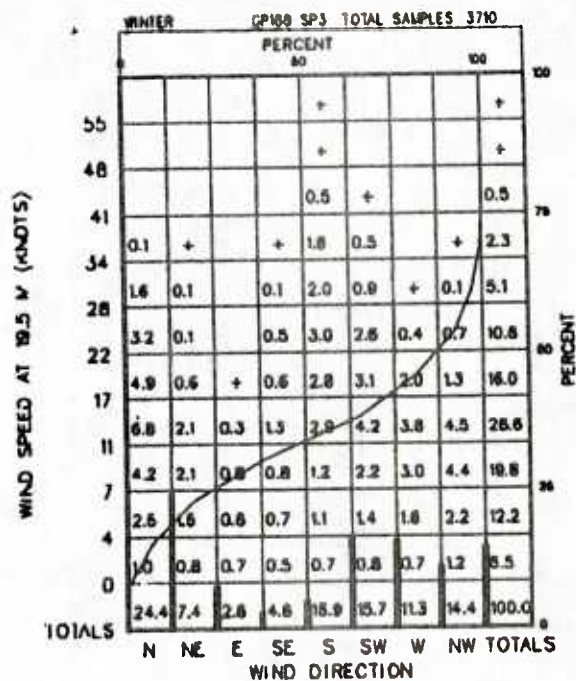


Figure A-188-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

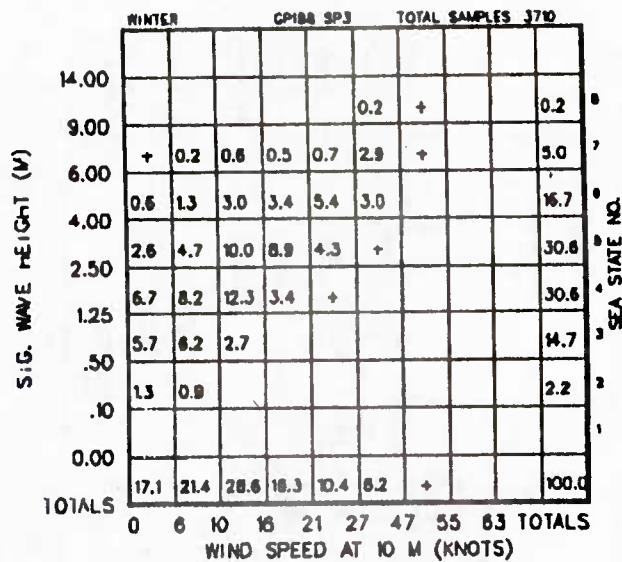


Figure A-188-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

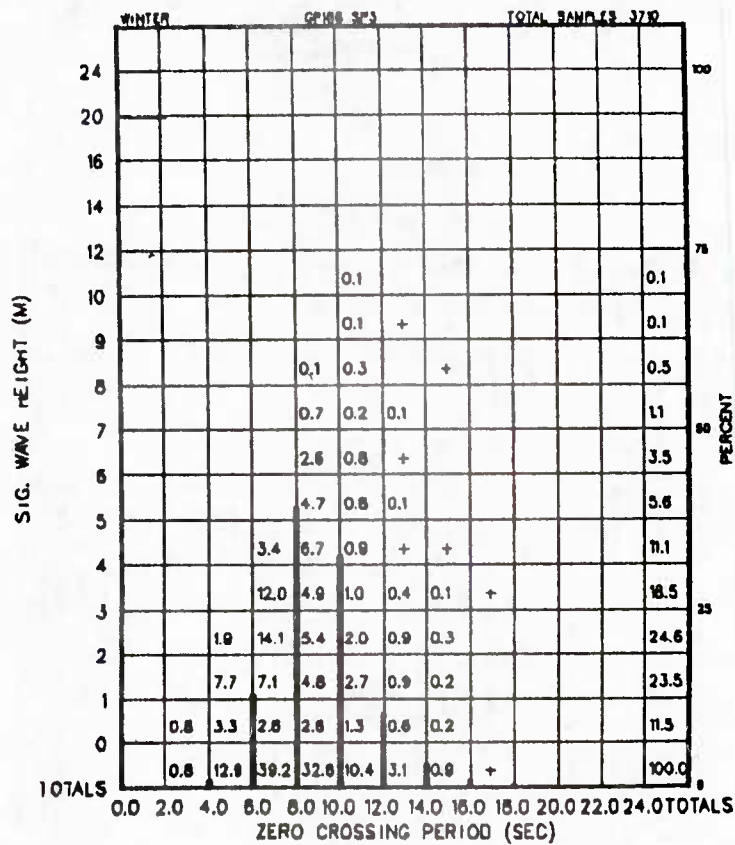


Figure A-188-2-6 Significant Wave Height vs. Zero Crossing Period

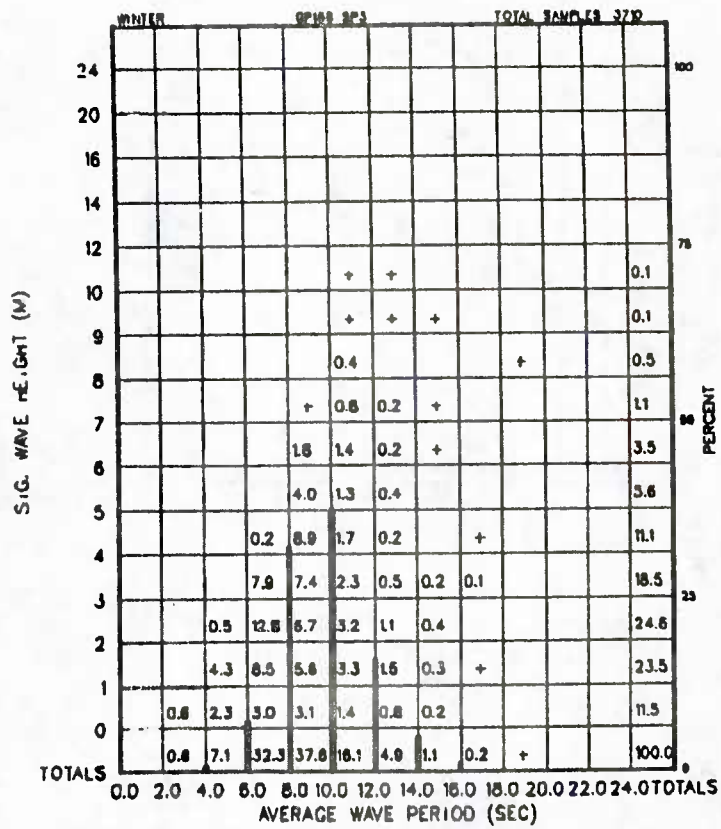


Figure A-188-2-7 Significant Wave Height vs. Average Wave Period

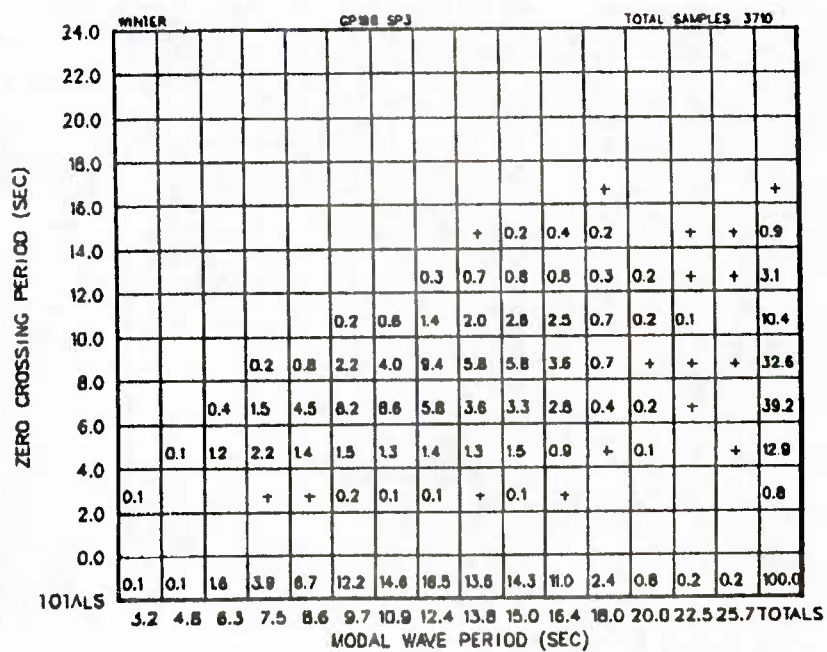


Figure A-188-2-8 Zero Crossing Period vs. Modal Wave Period

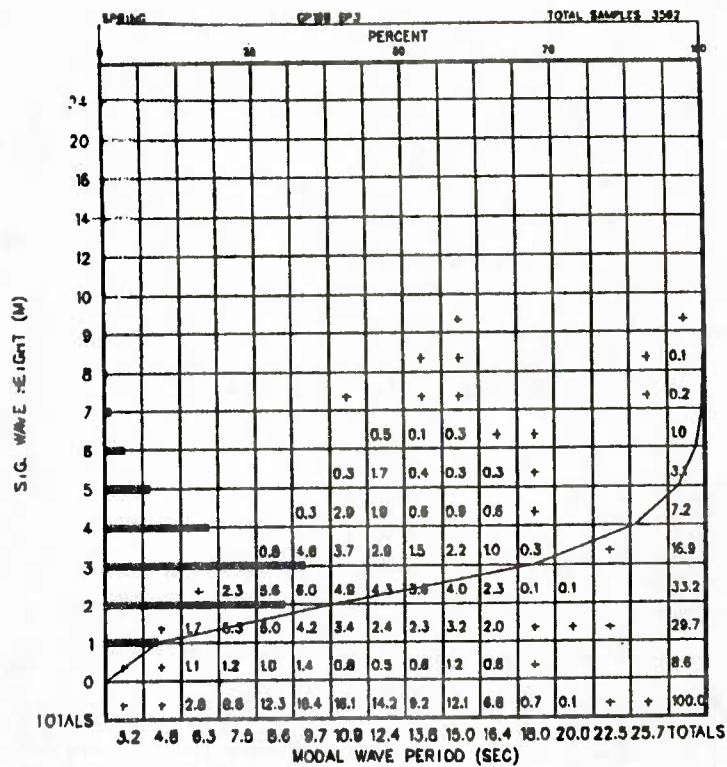


Figure A-188-3-1 Significant Wave Height vs. Modal Wave Period

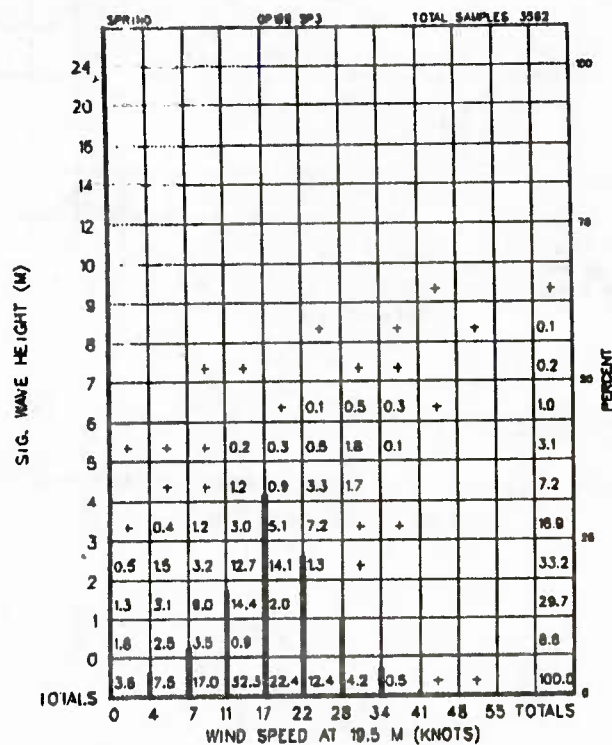


Figure A-188-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

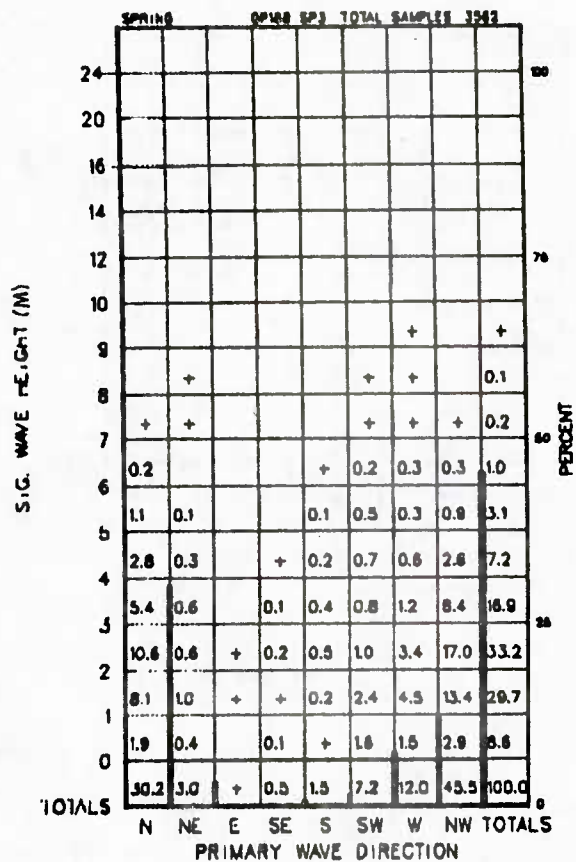


Figure A-188-3-3 Significant Wave Height vs. Primary Wave Direction

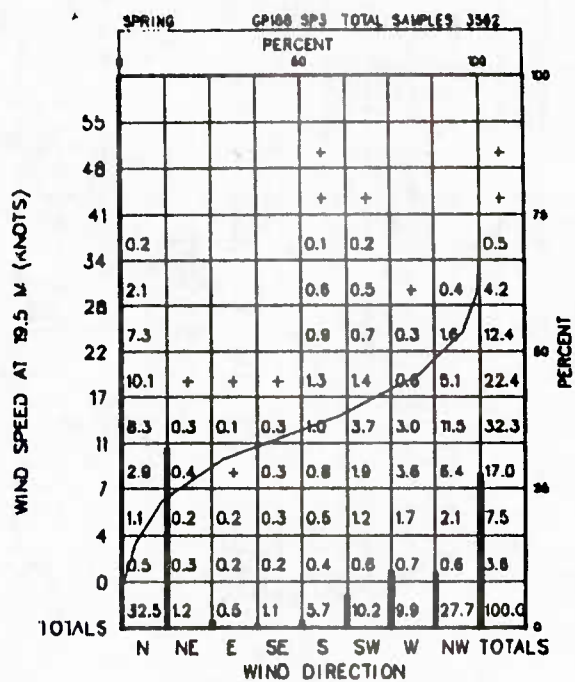


Figure A-188-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

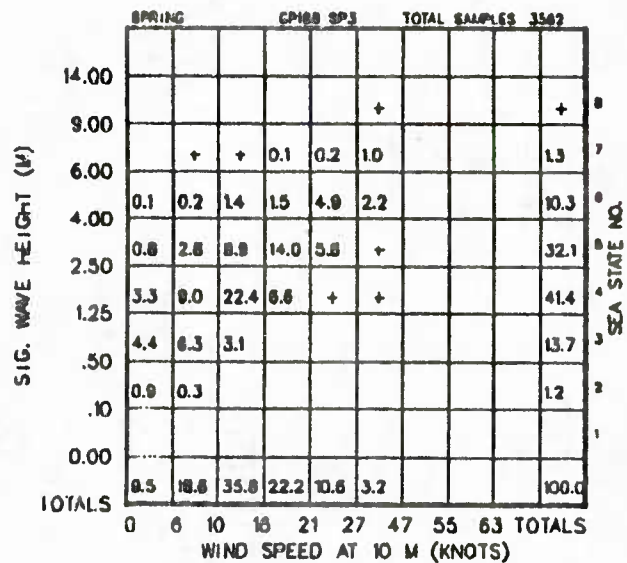


Figure A-188-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

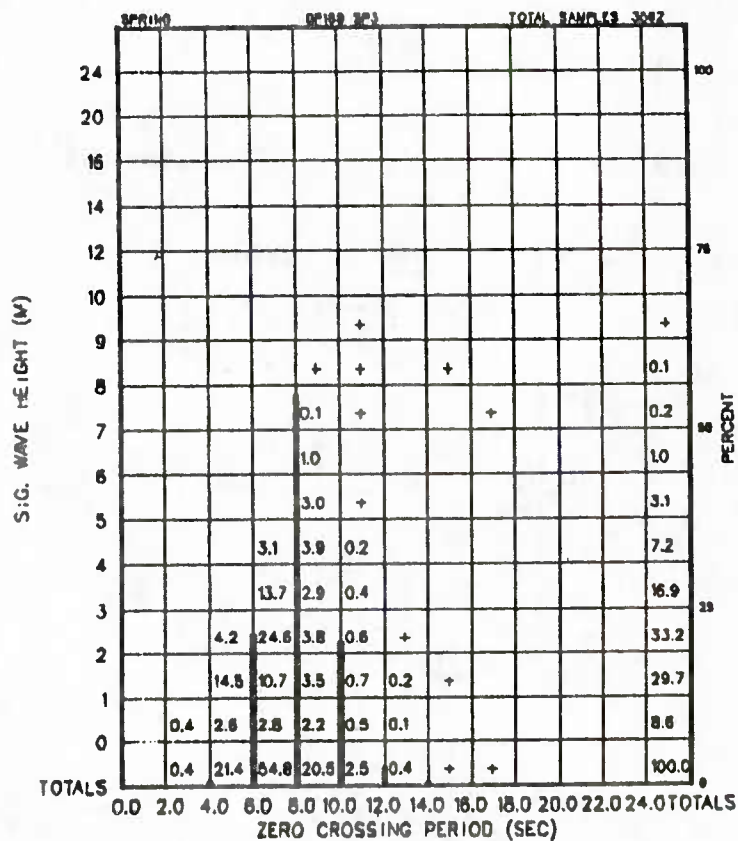


Figure A-188-3-6 Significant Wave Height vs. Zero Crossing Period

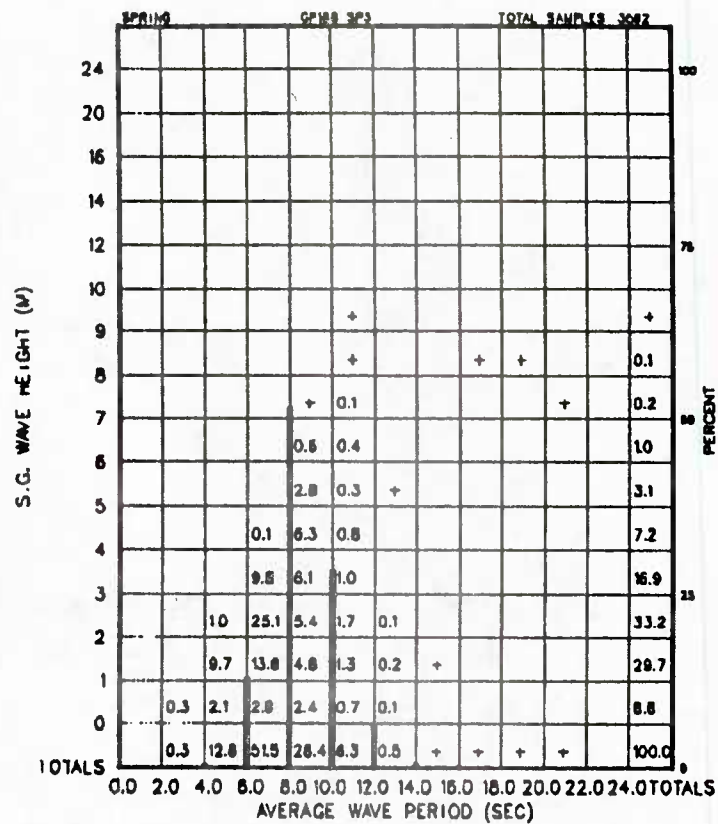


Figure A-188-3-7 Significant Wave Height vs. Average Wave Period

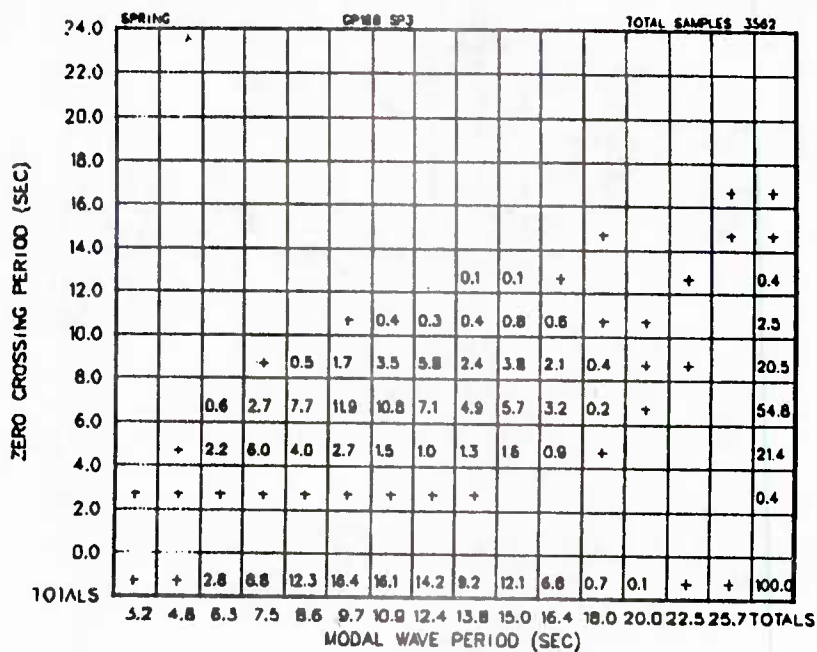


Figure A-188-3-8 Zero Crossing Period vs. Modal Wave Period

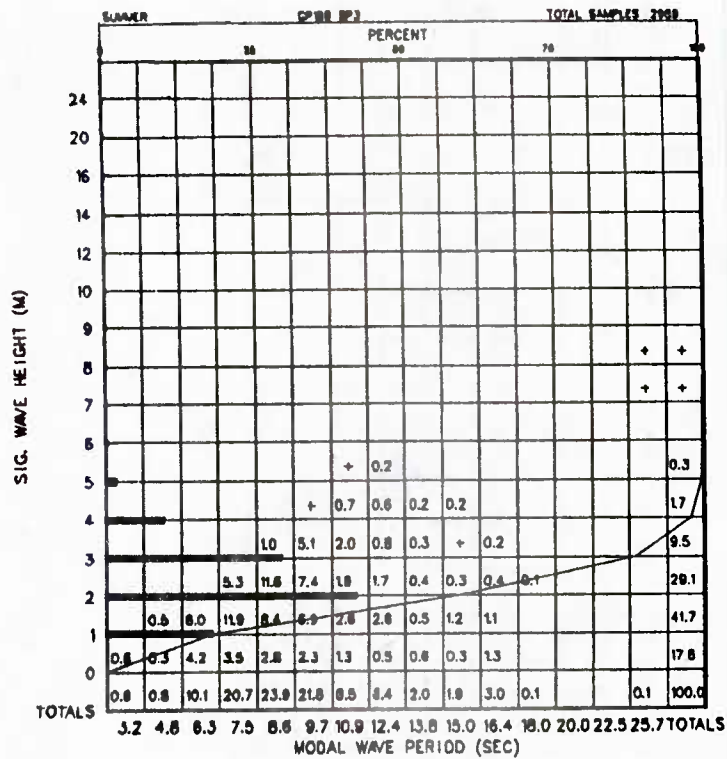


Figure A-188-4-1 Significant Wave Height vs. Modal Wave Period

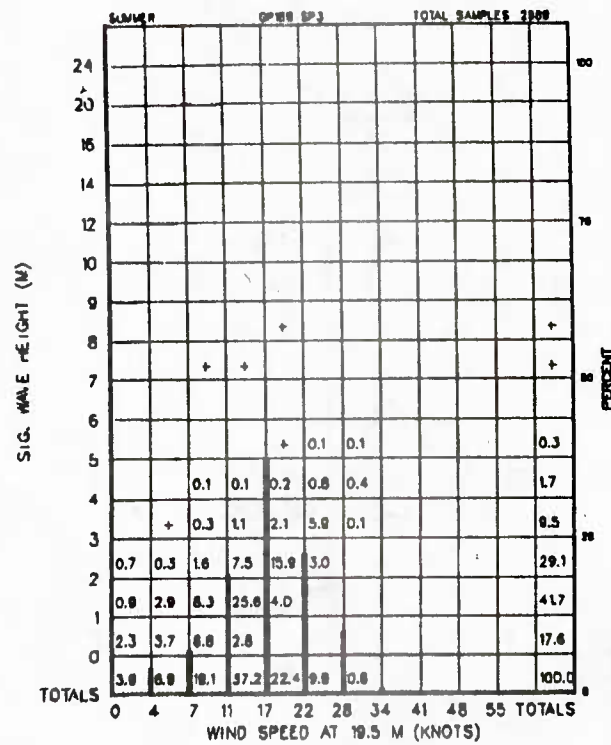


Figure A-188-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

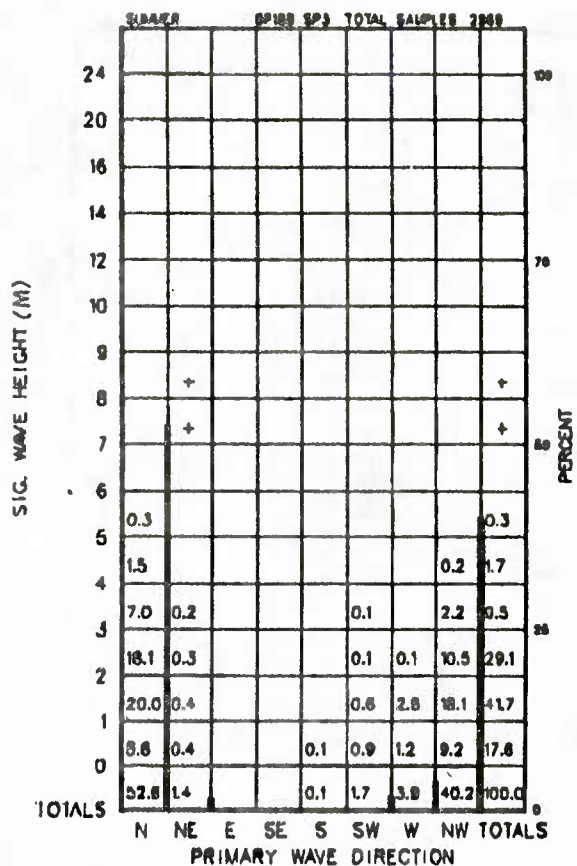


Figure A-188-4-3 Significant Wave Height vs. Primary Wave Direction

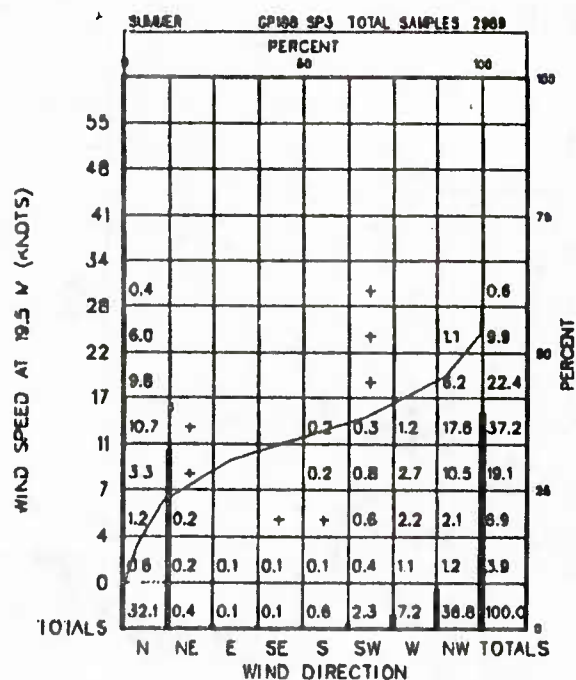


Figure A-188-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

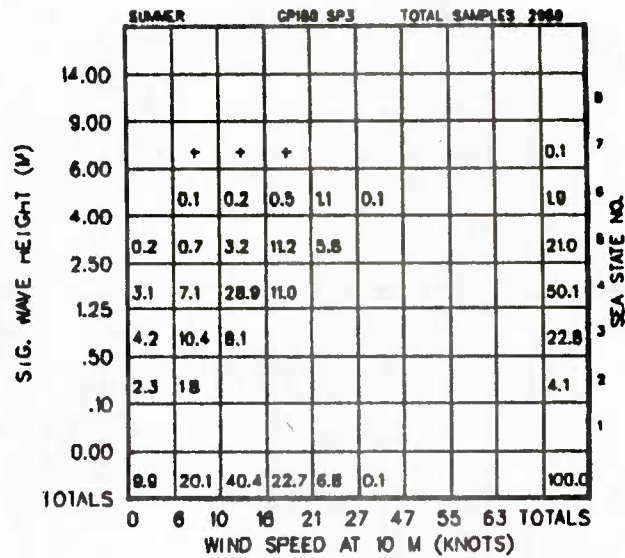


Figure A-188-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

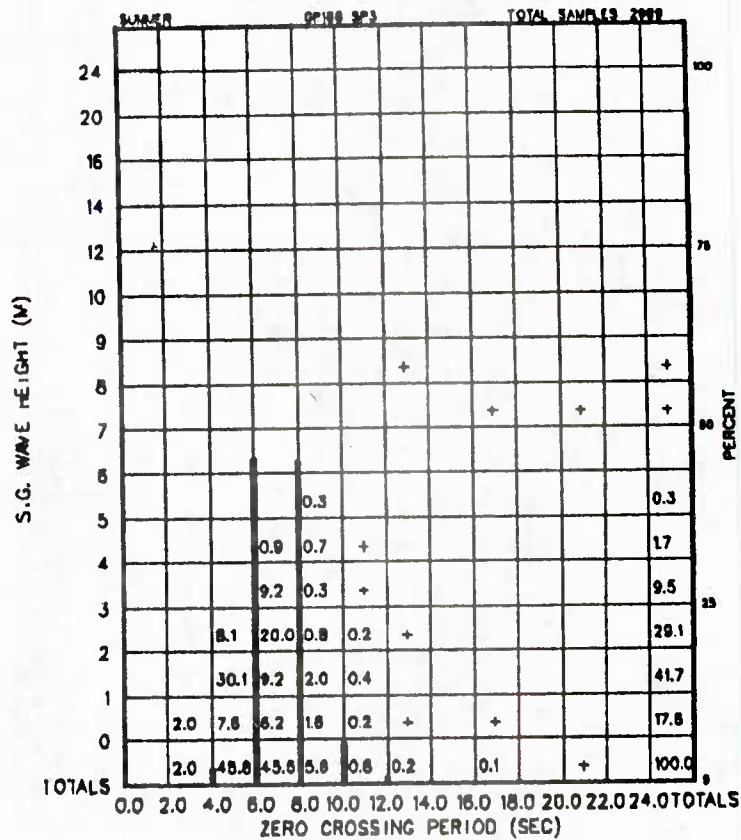


Figure A-188-4-6 Significant Wave Height vs. Zero Crossing Period

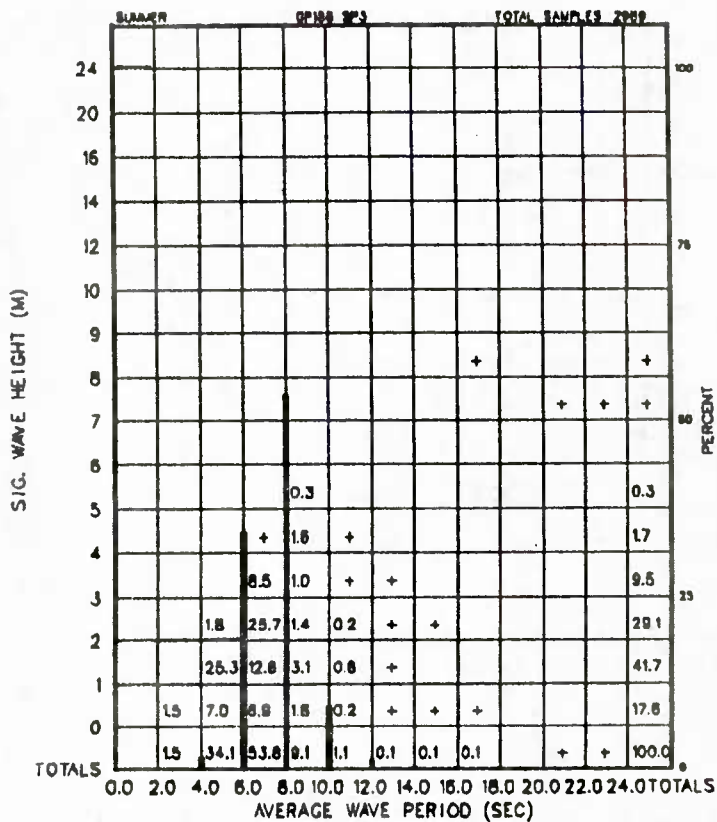


Figure A-188-4-7 Significant Wave Height vs. Average Wave Period

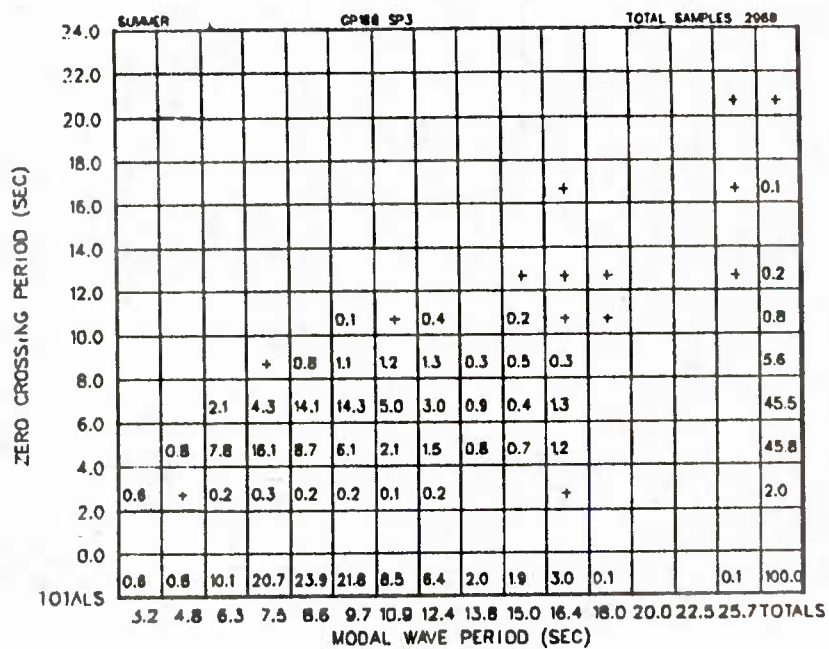


Figure A-188-4-8 Zero Crossing Period vs. Modal Wave Period



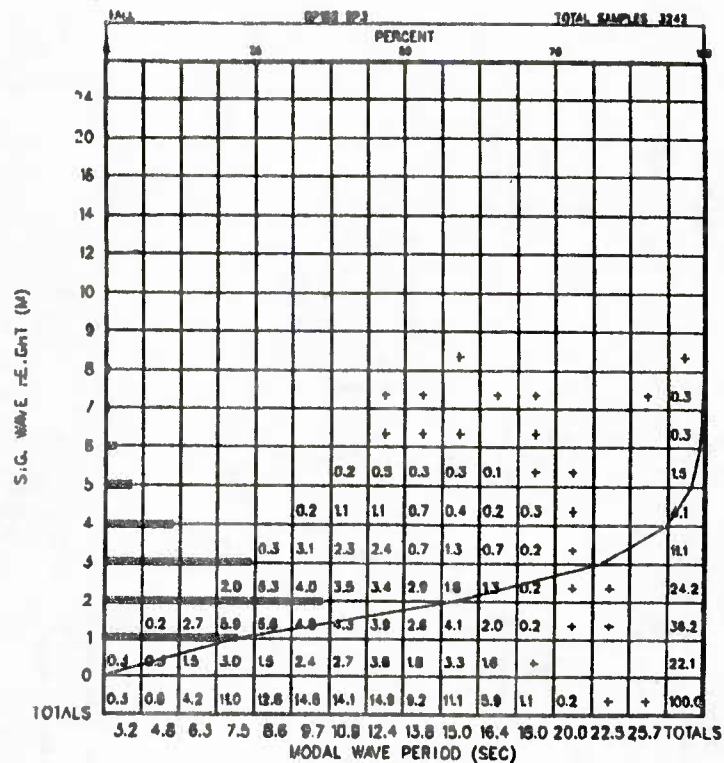


Figure A-188-5-1 Significant Wave Height vs. Modal Wave Period

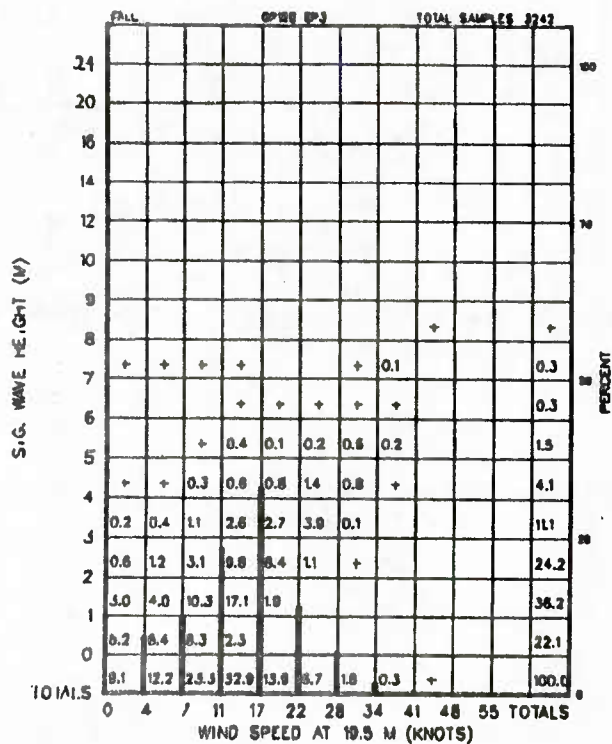


Figure A-188-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

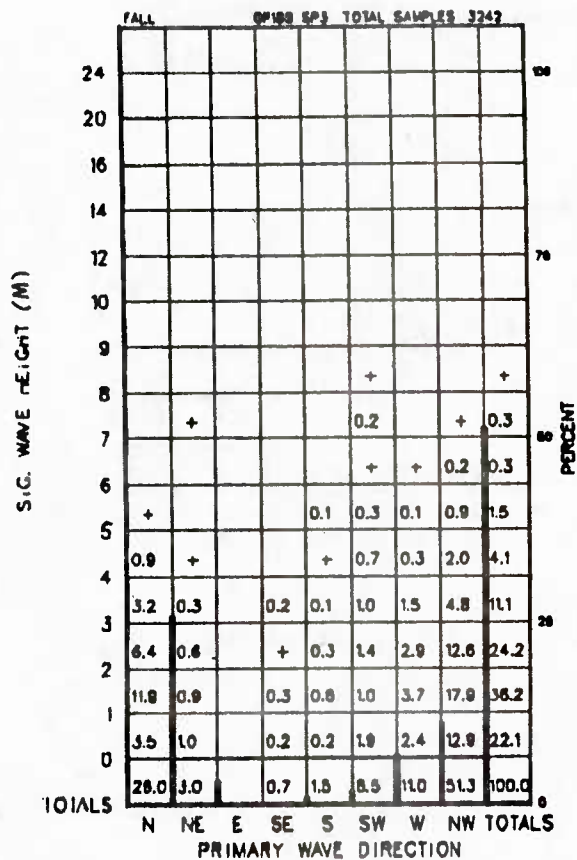


Figure A-188-5-3 Significant Wave Height vs. Primary Wave Direction

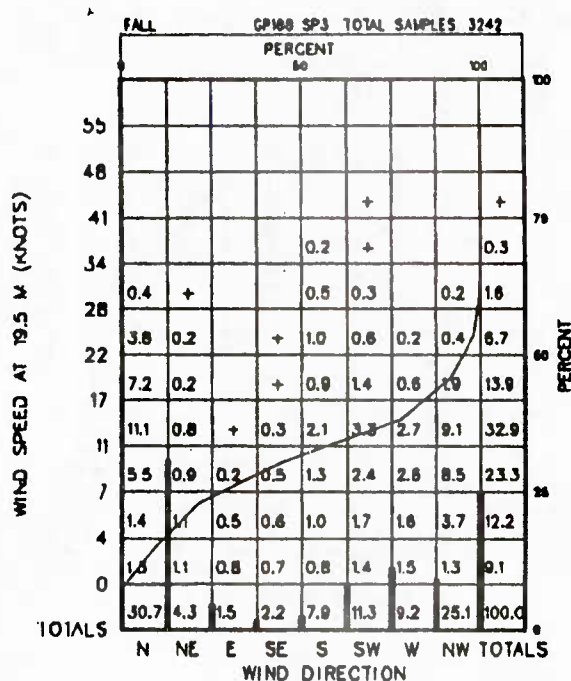


Figure A-188-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

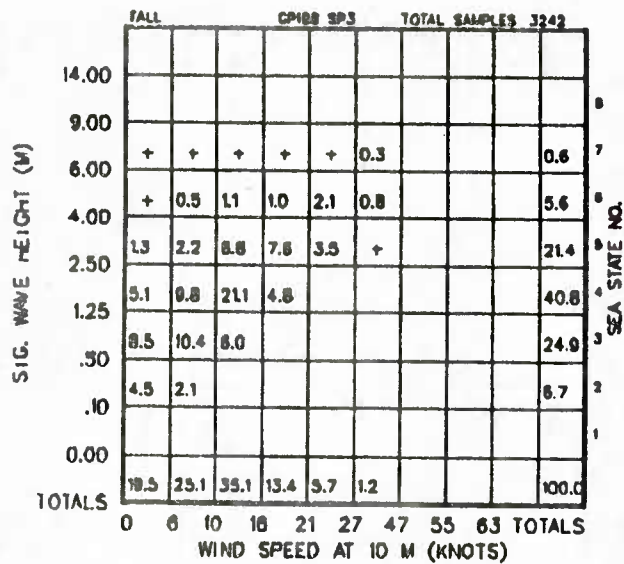


Figure A-188-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

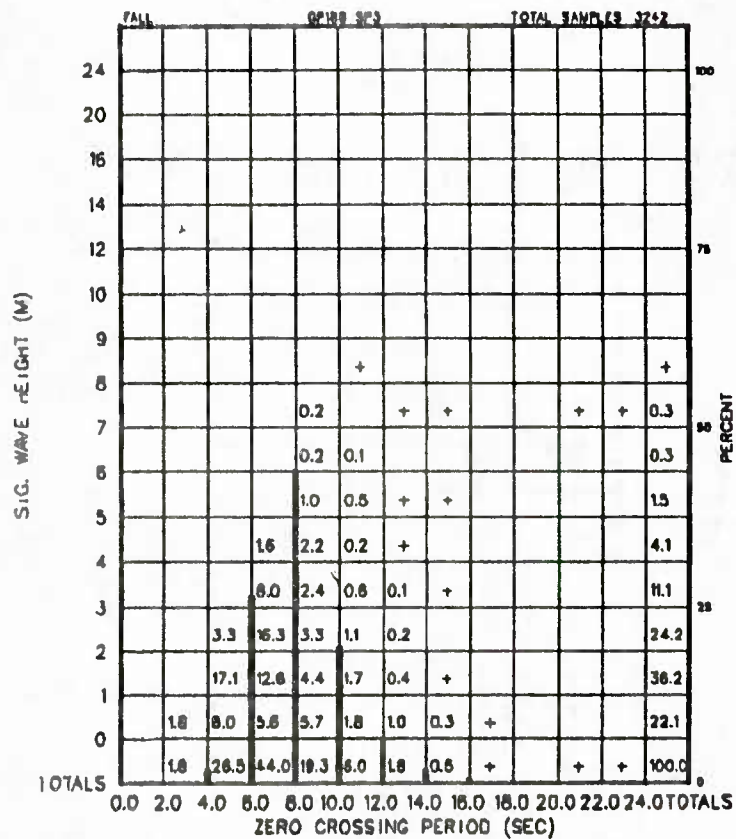


Figure A-188-5-6 Significant Wave Height vs. Zero Crossing Period

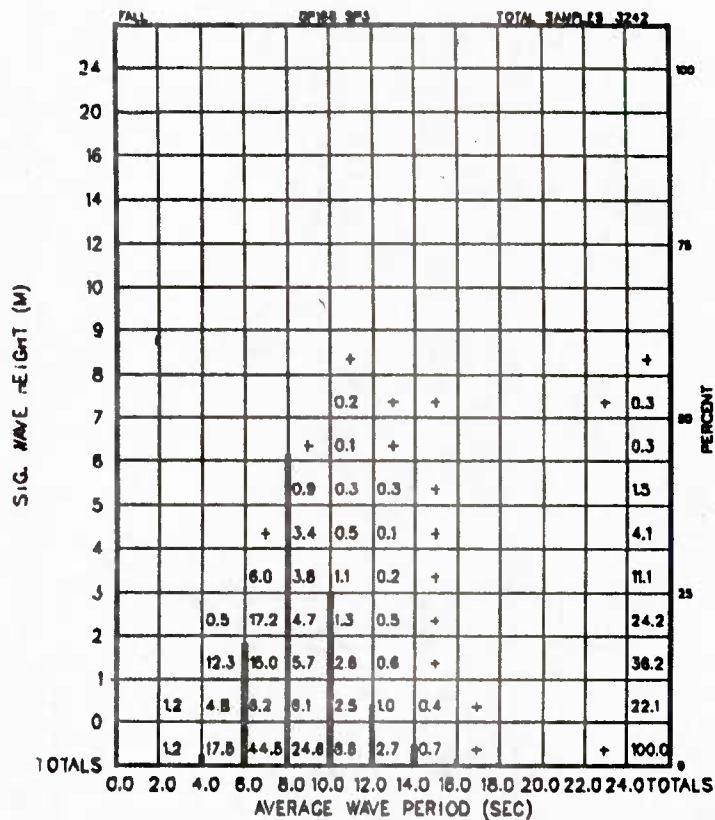


Figure A-188-5-7 Significant Wave Height vs. Average Wave Period

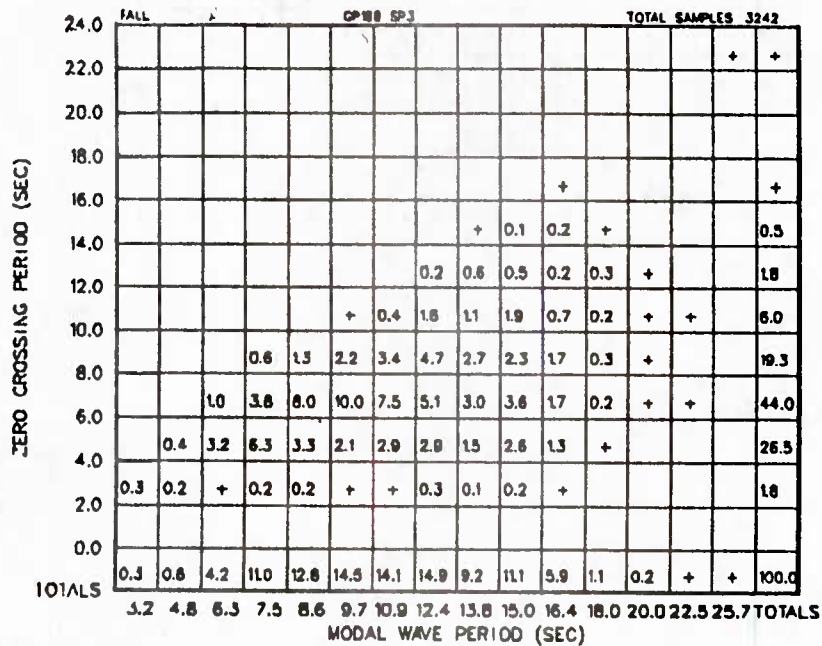


Figure A-188-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-202-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 43.73°N, 128.73°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	2.5 11 -	7 17.5 -	3 11.75 -	1.5 12.4 W-NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	14 2.25 -	35 6.5 -	15.75 3 -	14 2.25 N-SW
Visibility, nautical miles	2	15	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 6	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 15% of the time Snow - 0.5% of the time (Dec-Mar)				
Relative Humidity, %	60	80	97	-	-
Air Temperature, °C	8.5	11	14	11.5	-
Sea Surface Temperature, °C	11.5	13.5	16	-	-
Sea Level Pressure, millibars	1000	1018	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 2% 3%

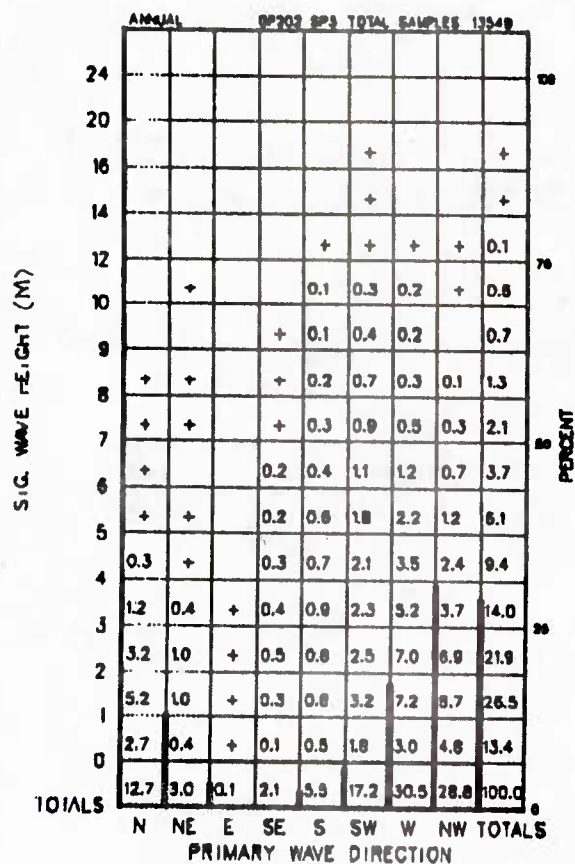


Figure A-202-1-3 Significant Wave Height vs. Primary Wave Direction

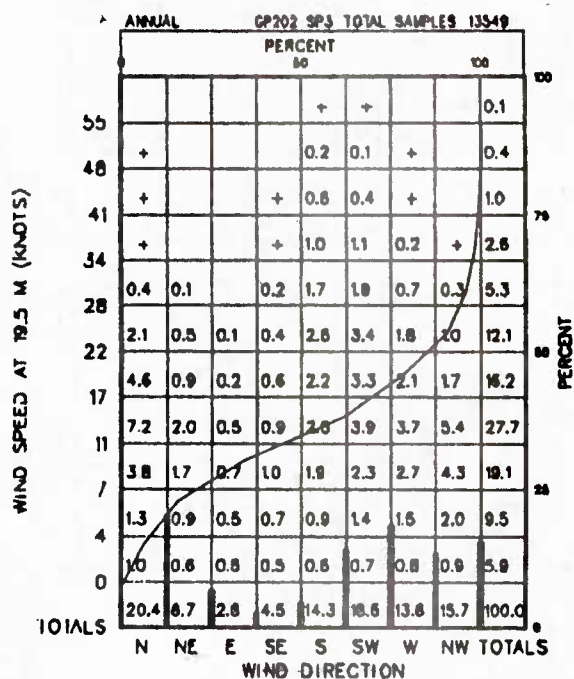


Figure A-202-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

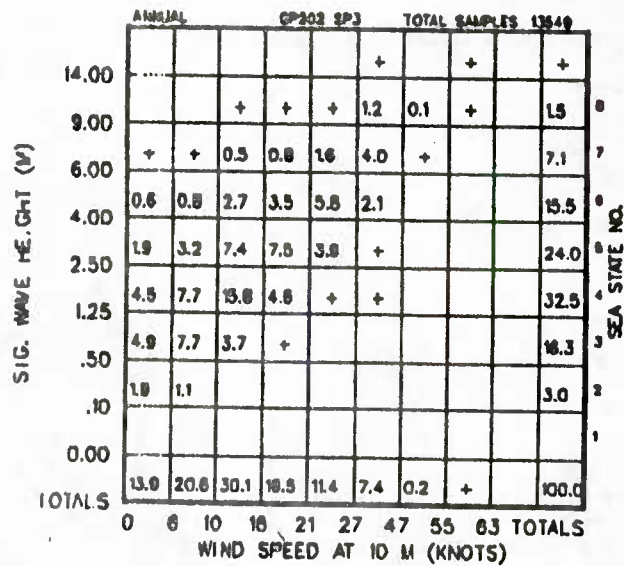


Figure A-202-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

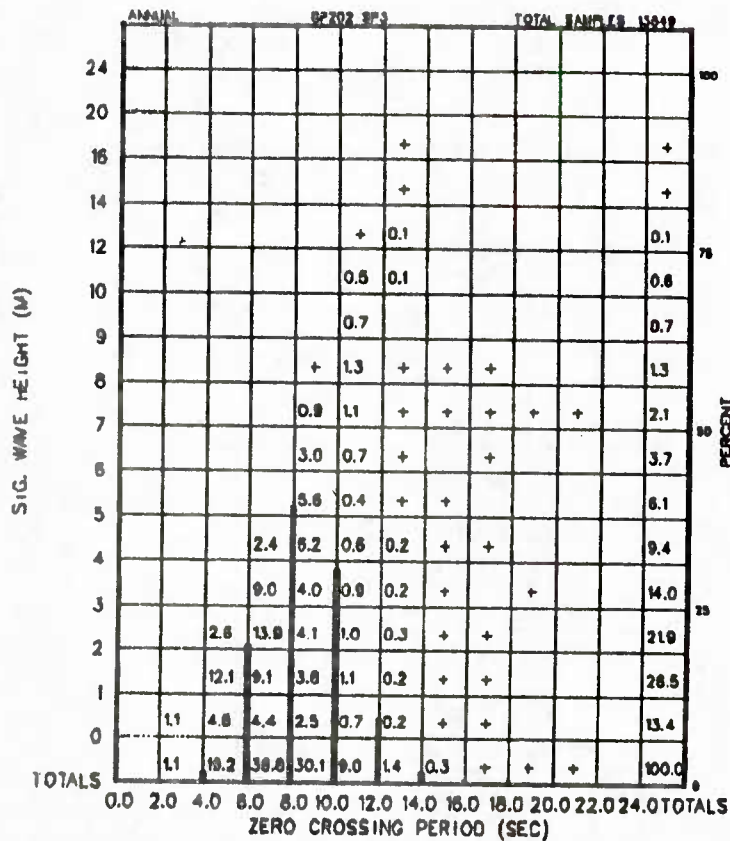


Figure A-202-1-6 Significant Wave Height vs. Zero Crossing Period

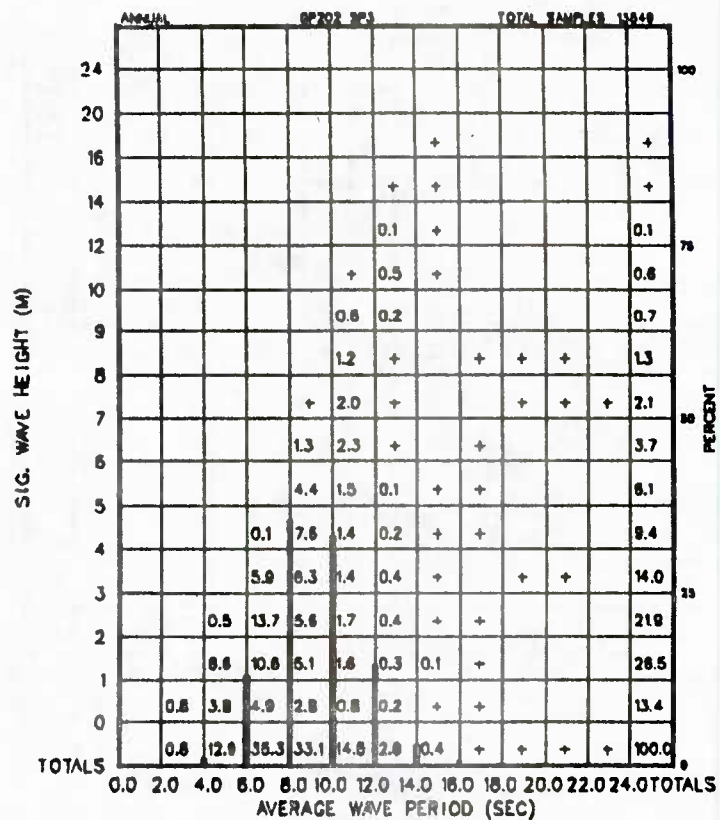


Figure A-202-1-7 Significant Wave Height vs. Average Wave Period

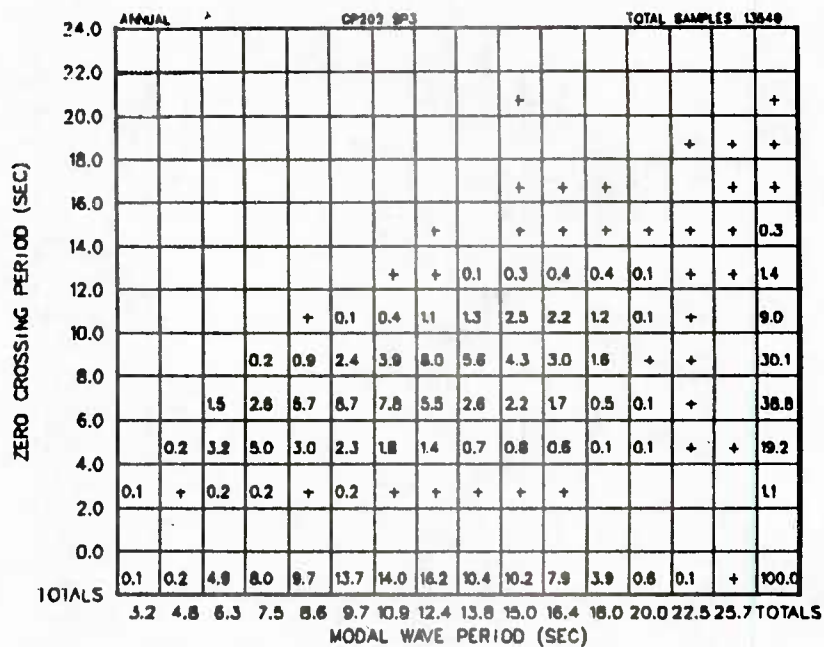


Figure A-202-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL																	CP202 SP3										TOTAL SAMPLES 13548										PERCENT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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Figure A-202-1-11 Persistence of Wind Speed
at 19.5 M (Knots)

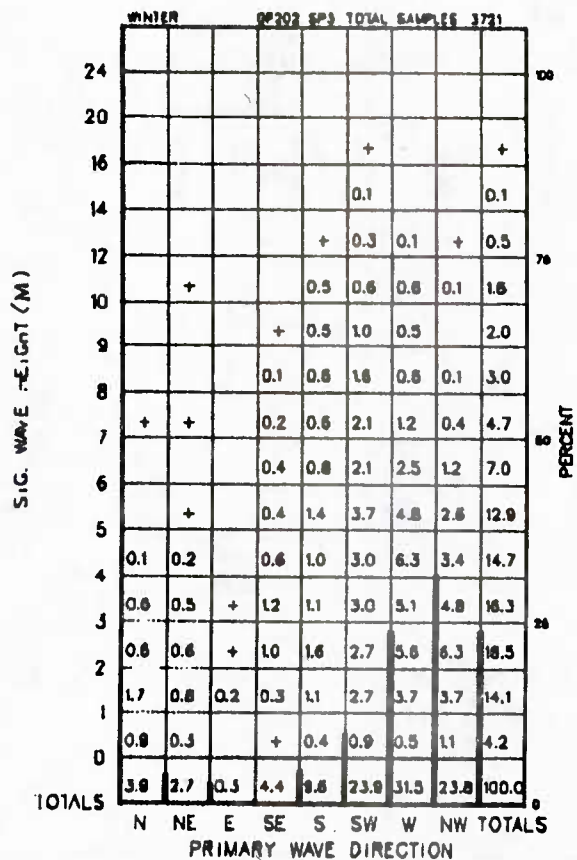


Figure A-202-2-3 Significant Wave Height vs. Primary Wave Direction

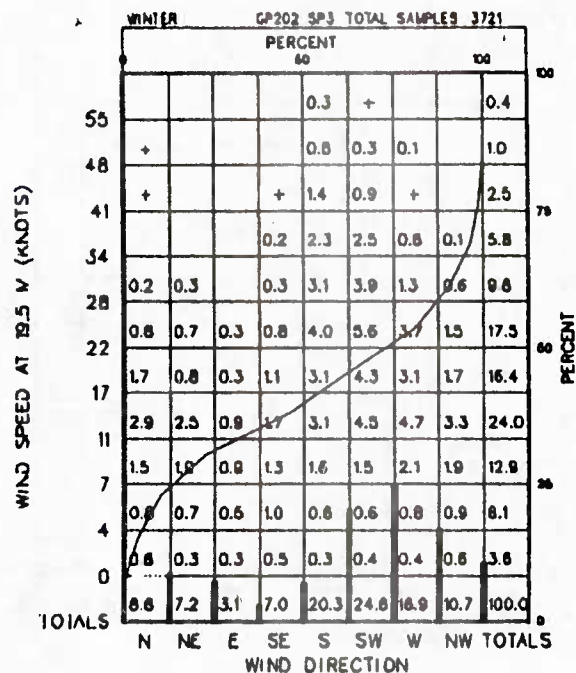


Figure A-202-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

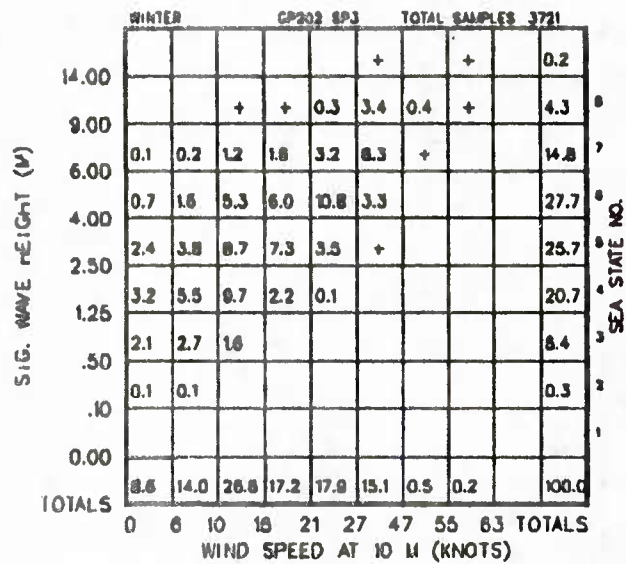


Figure A-202-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

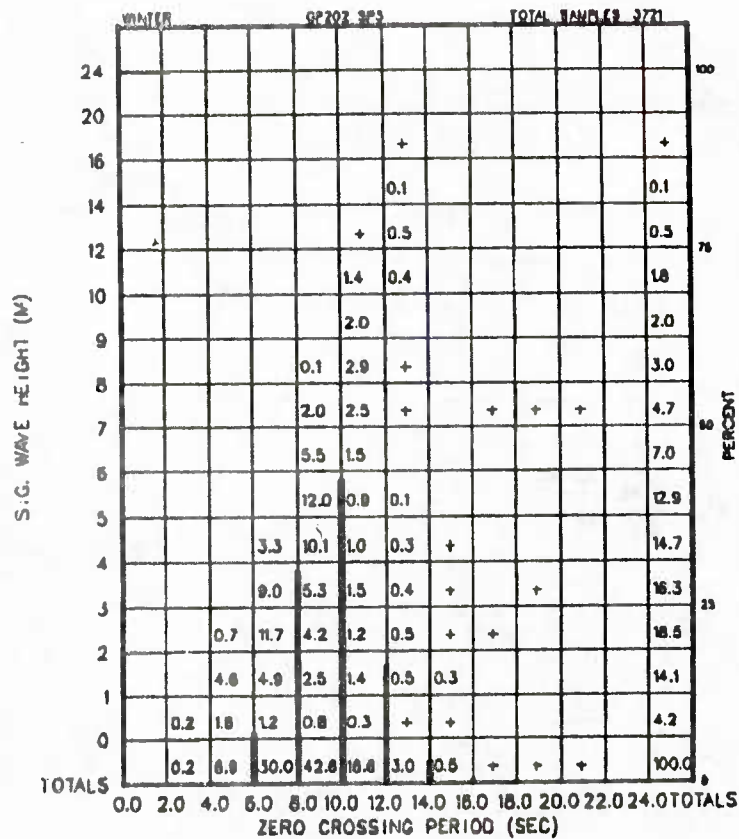


Figure A-202-2-6 Significant Wave Height vs. Zero Crossing Period

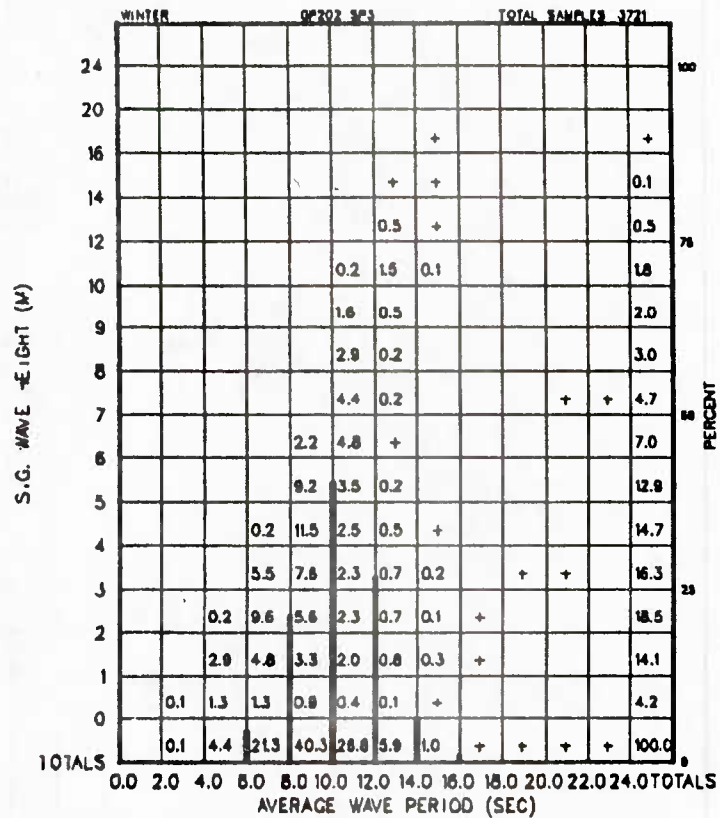


Figure A-202-2-7 Significant Wave Height vs. Average Wave Period

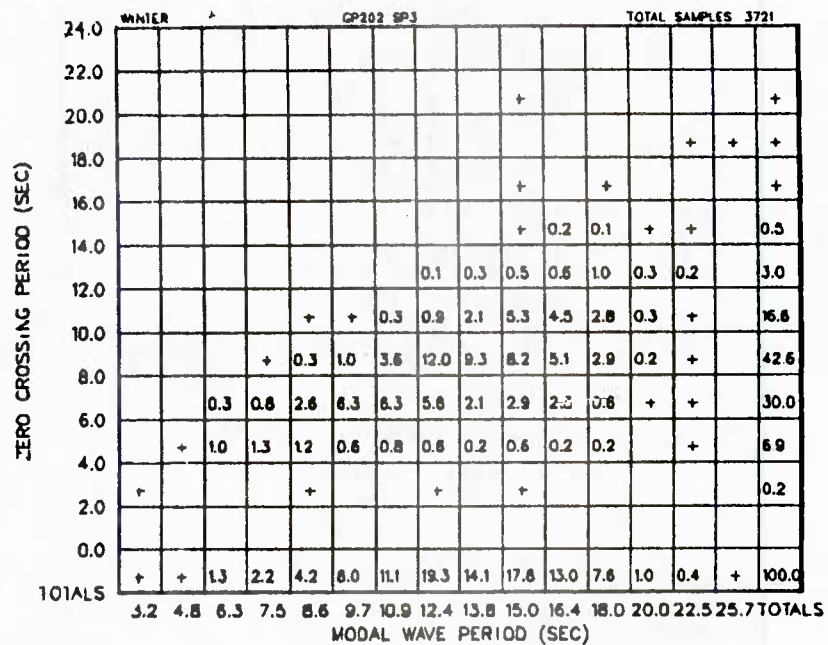


Figure A-202-2-8 Zero Crossing Period vs. Modal Wave Period

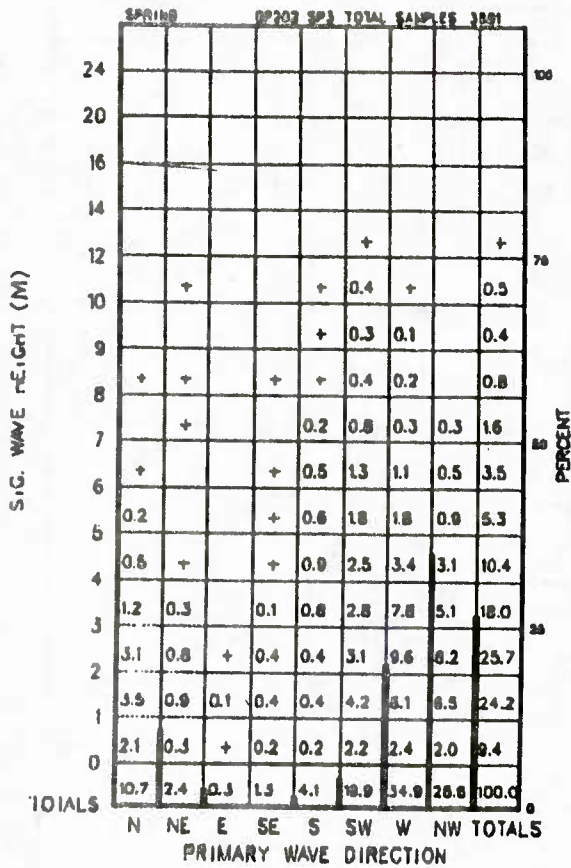


Figure A-202-3-3 Significant Wave Height vs. Primary Wave Direction

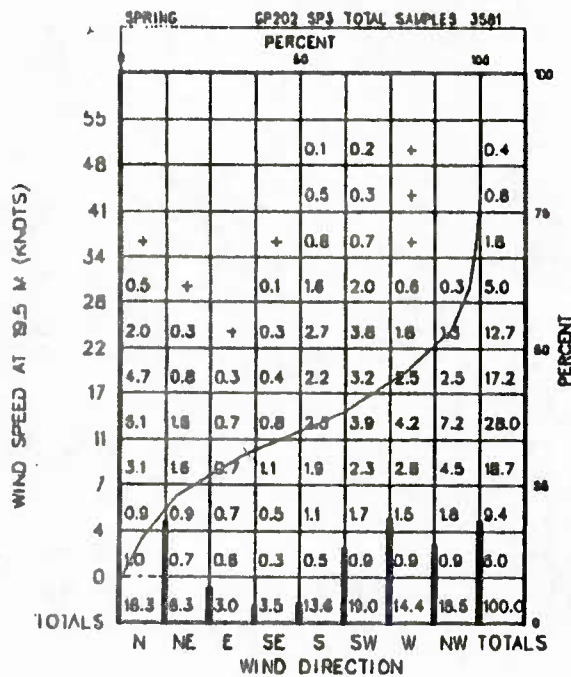


Figure A-202-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

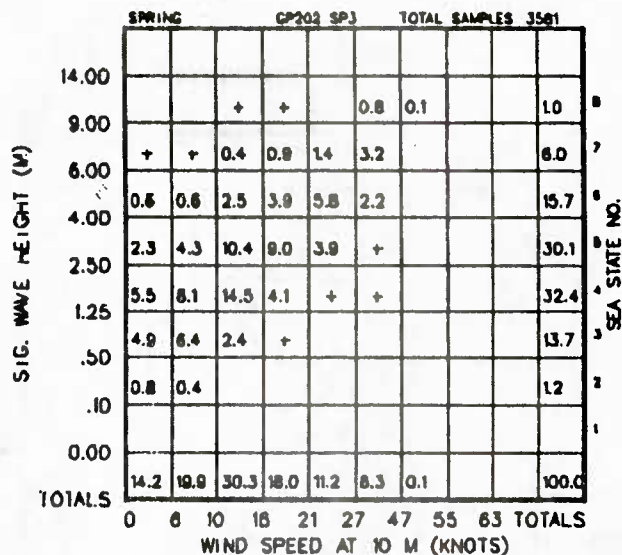


Figure A-202-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

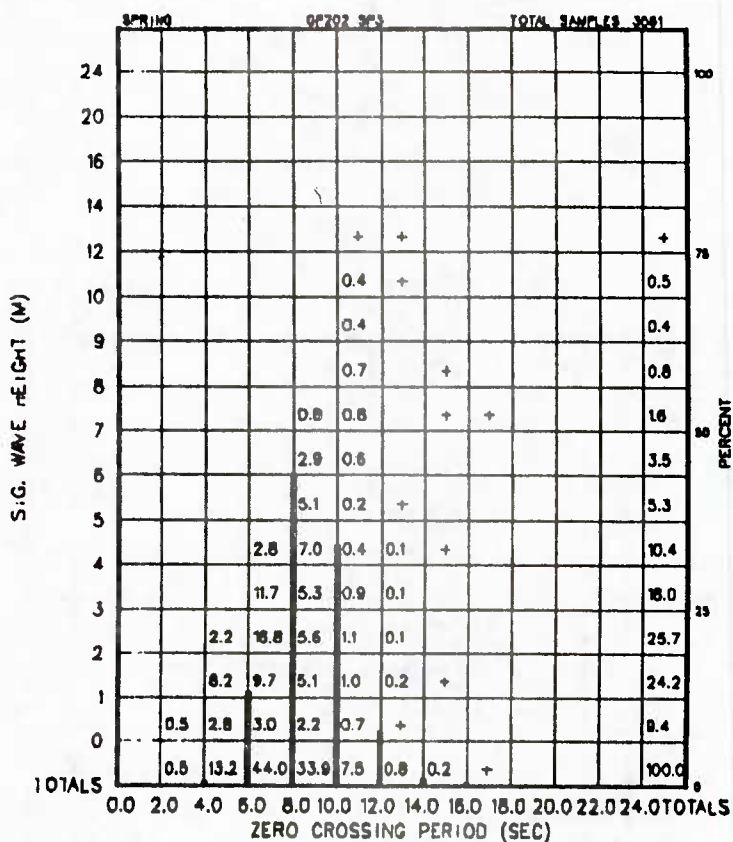


Figure A-202-3-6 Significant Wave Height vs. Zero Crossing Period

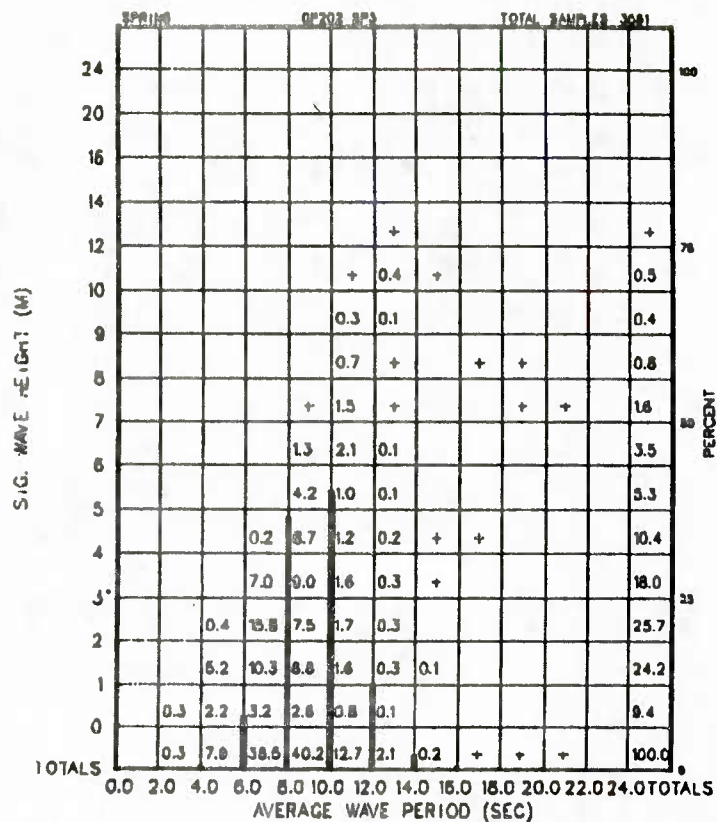


Figure A-202-3-7 Significant Wave Height vs. Average Wave Period

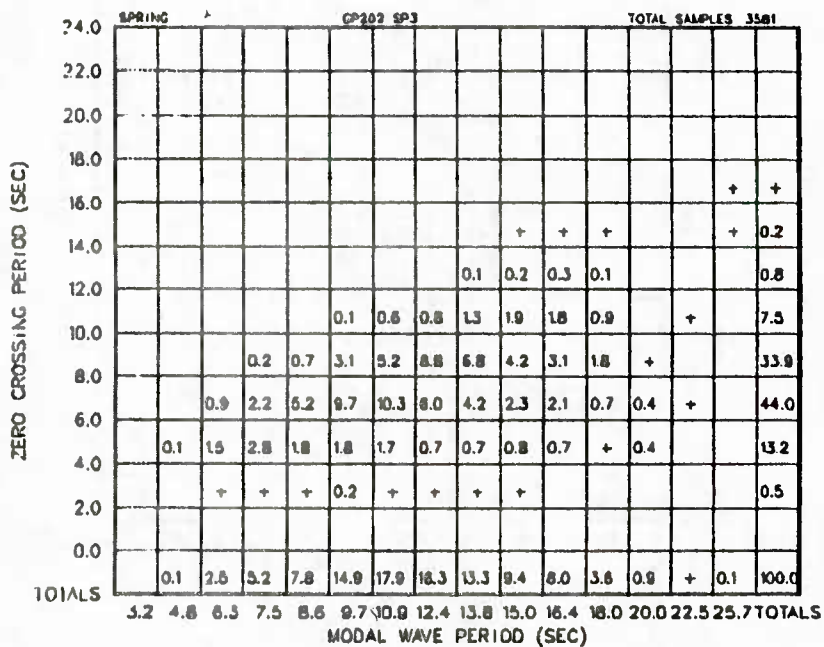


Figure A-202-3-8 Zero Crossing Period vs. Modal Wave Period



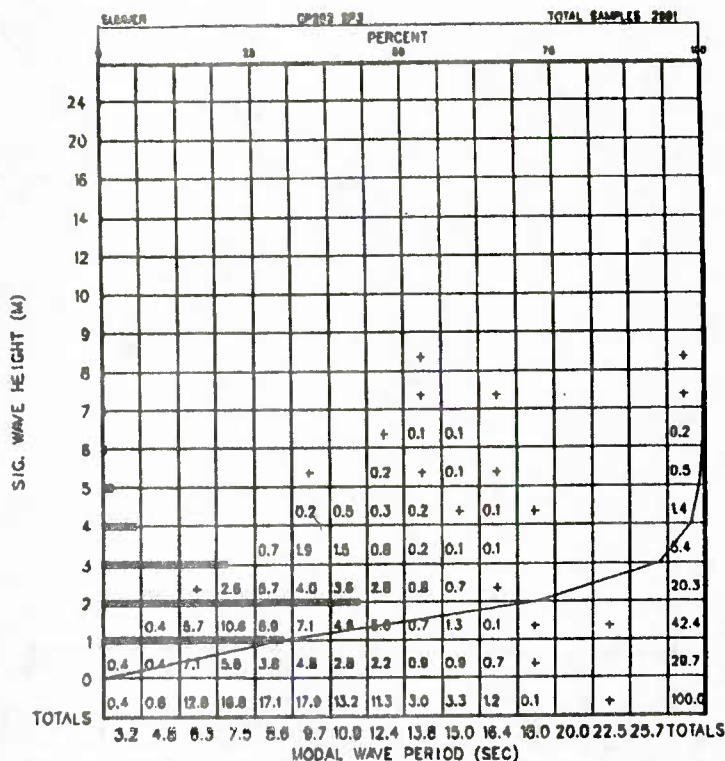


Figure A-202-4-1 Significant Wave Height vs. Modal Wave Period

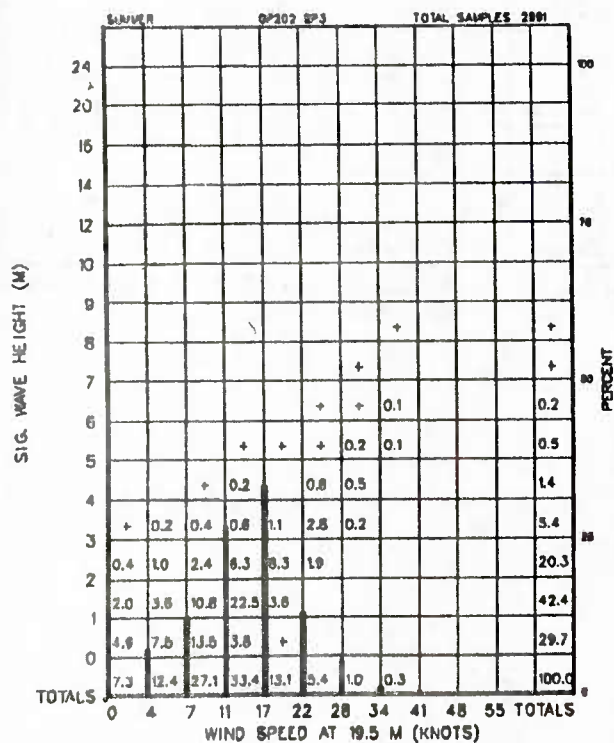


Figure A-202-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

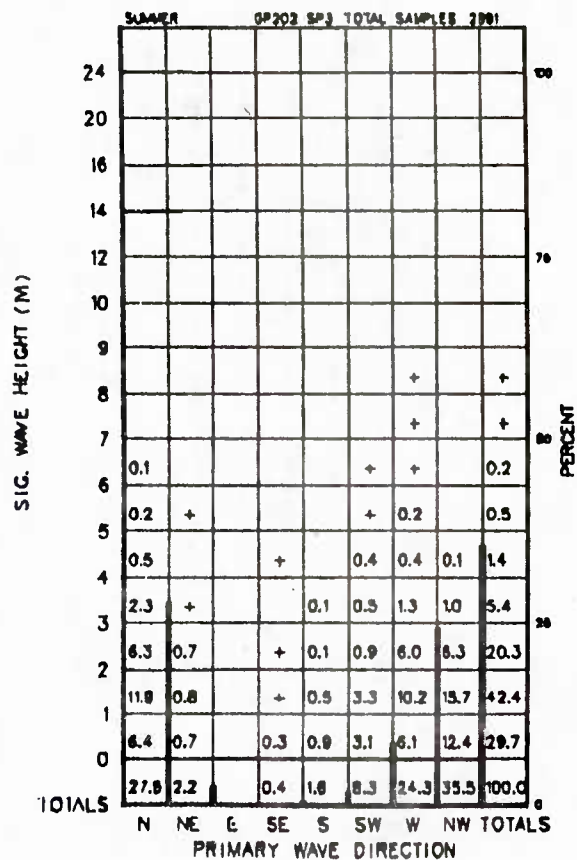


Figure A-202-4-3 Significant Wave Height vs. Primary Wave Direction

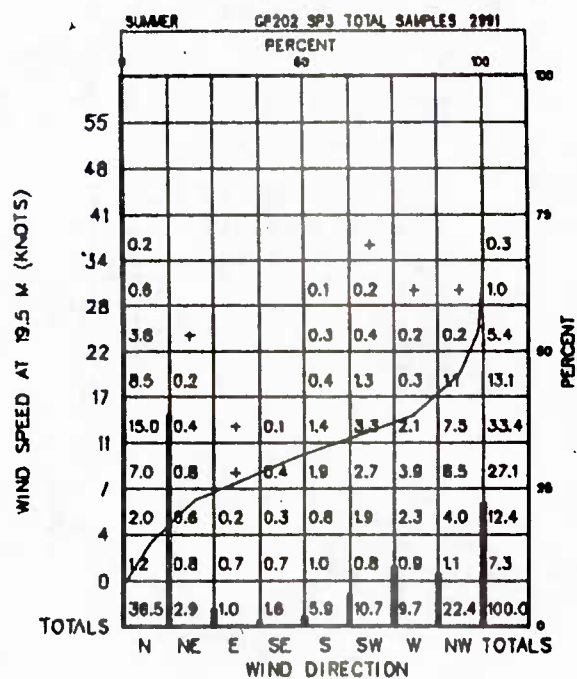


Figure A-202-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

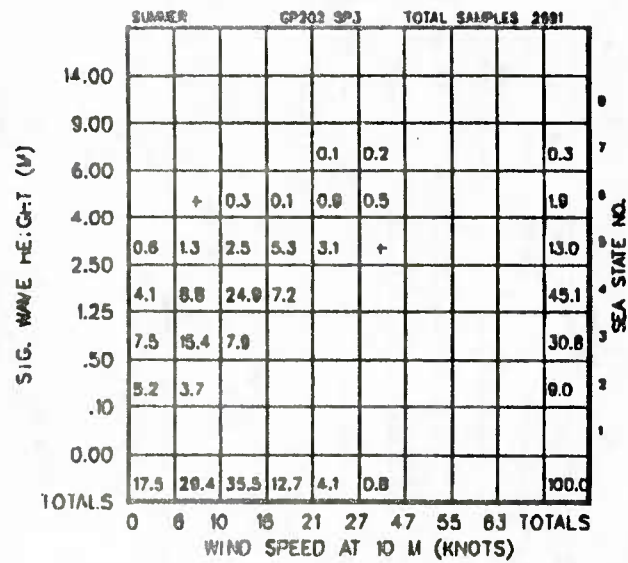


Figure A-202-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

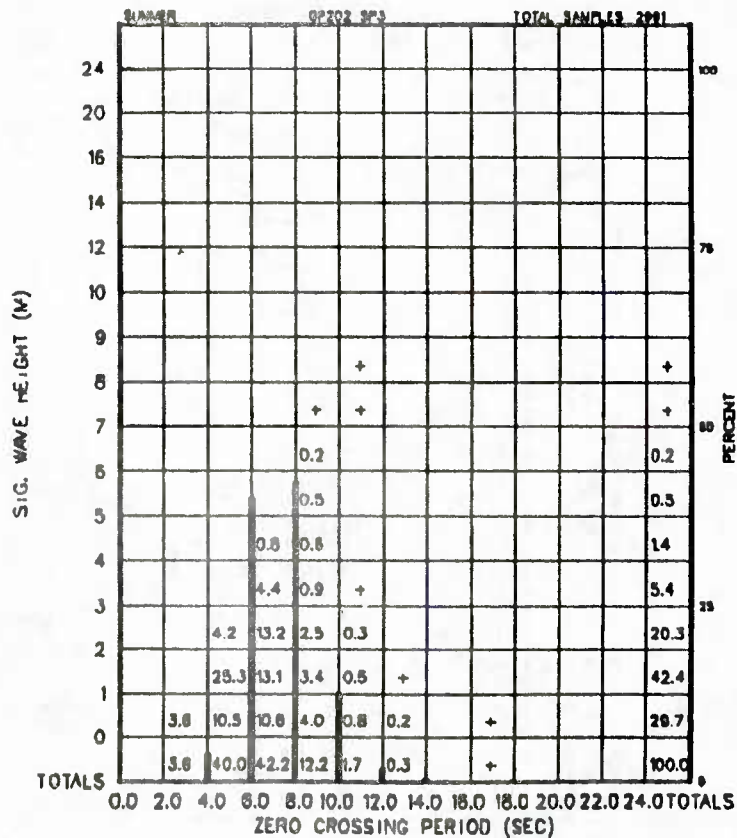


Figure A-202-4-6 Significant Wave Height vs. Zero Crossing Period

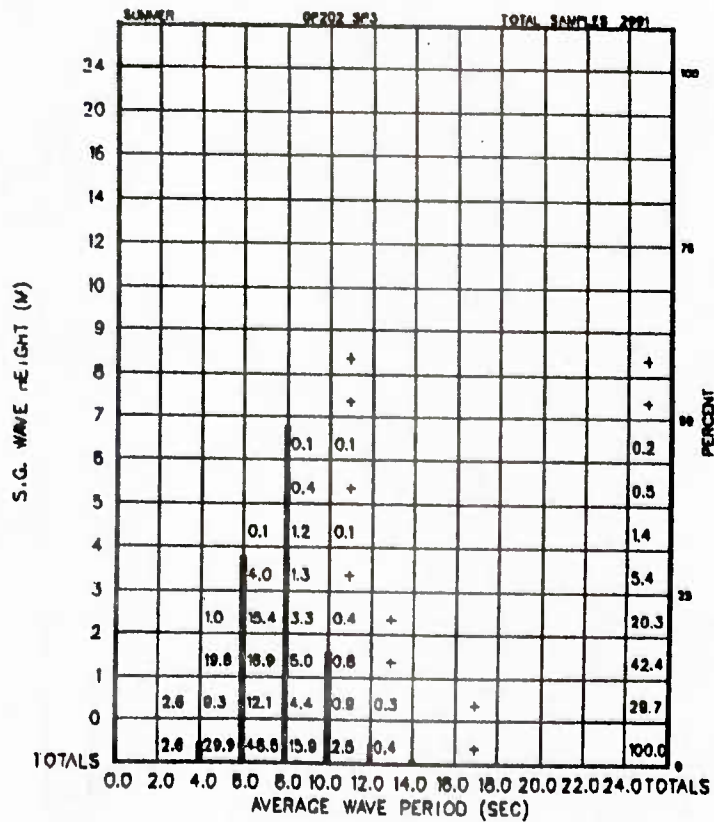


Figure A-202-4-7 Significant Wave Height vs. Average Wave Period

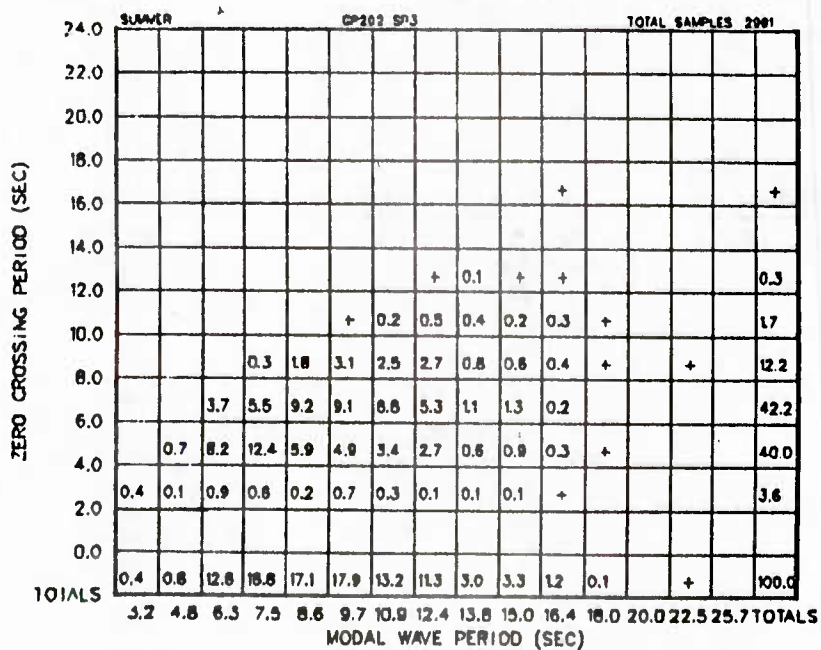


Figure A-202-4-8 Zero Crossing Period vs. Modal Wave Period

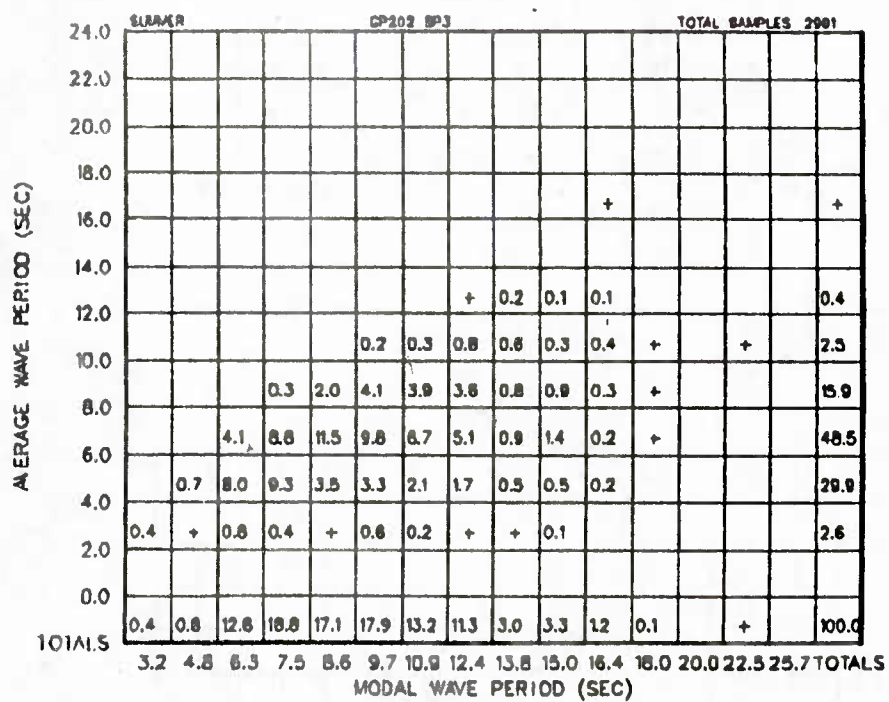


Figure A-202-4-9 Average Wave Period vs.
Modal Wave Period

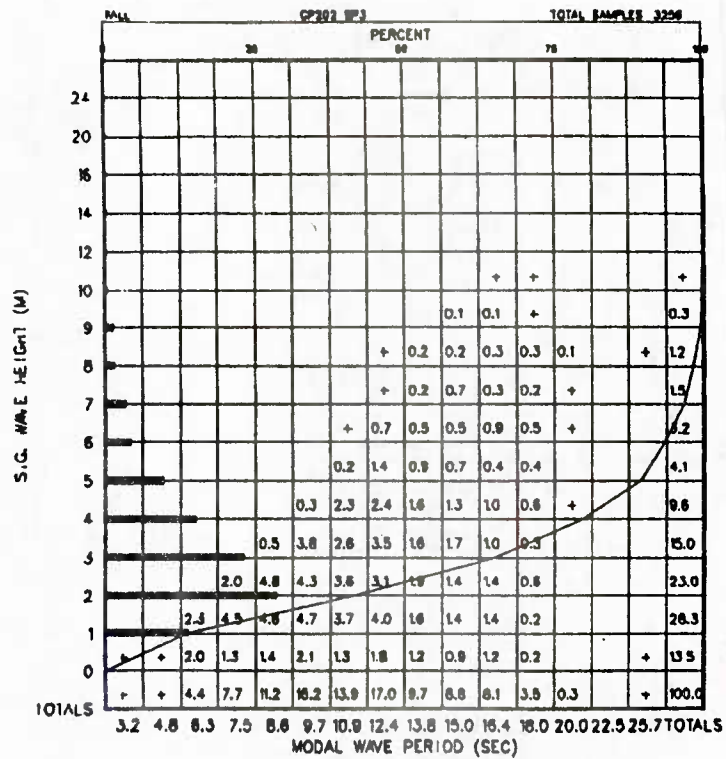


Figure A-202-5-1 Significant Wave Height vs. Modal Wave Period

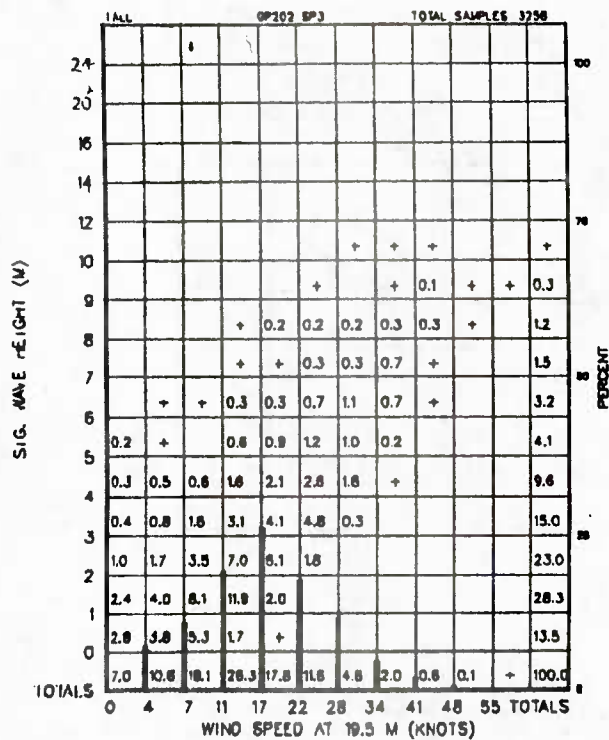


Figure A-202-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

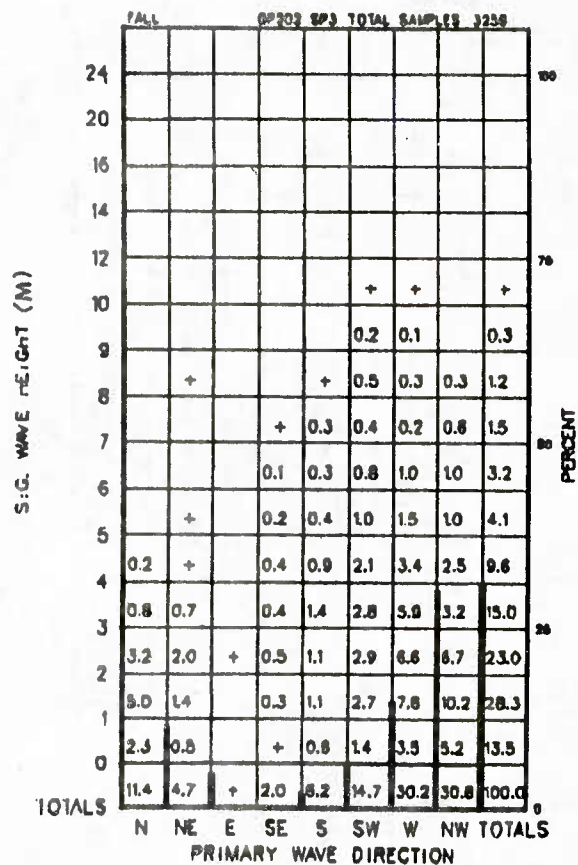


Figure A-202-5-3 Significant Wave Height vs. Primary Wave Direction

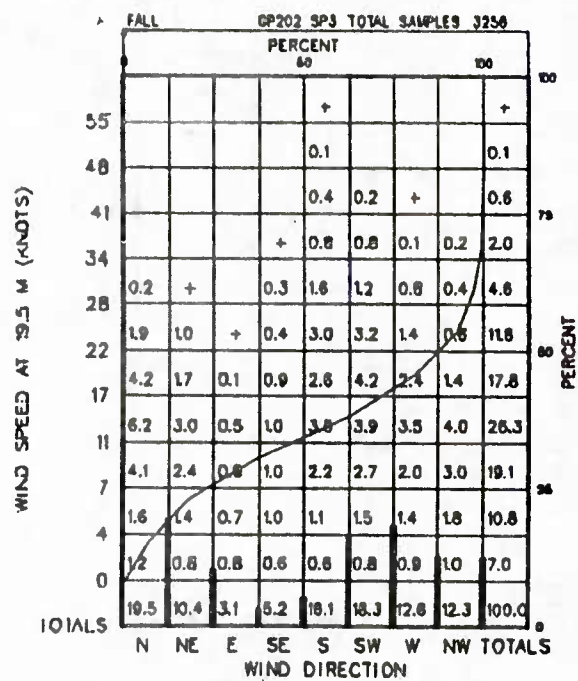


Figure A-202-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

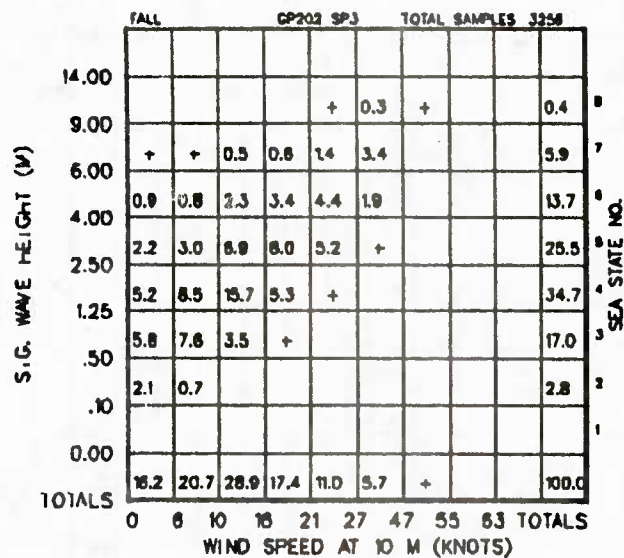


Figure A-202-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

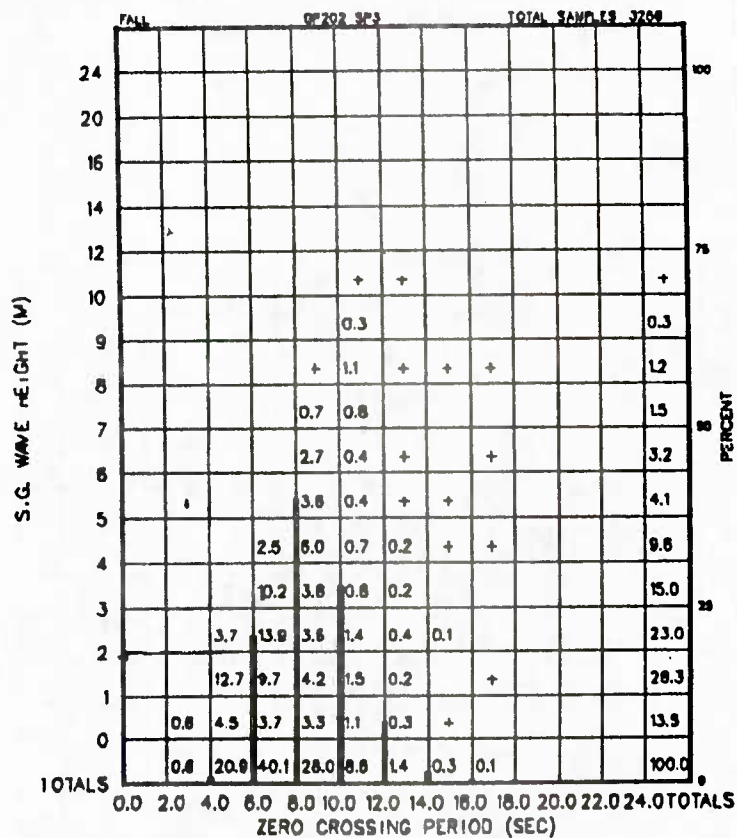


Figure A-202-5-6 Significant Wave Height vs. Zero Crossing Period

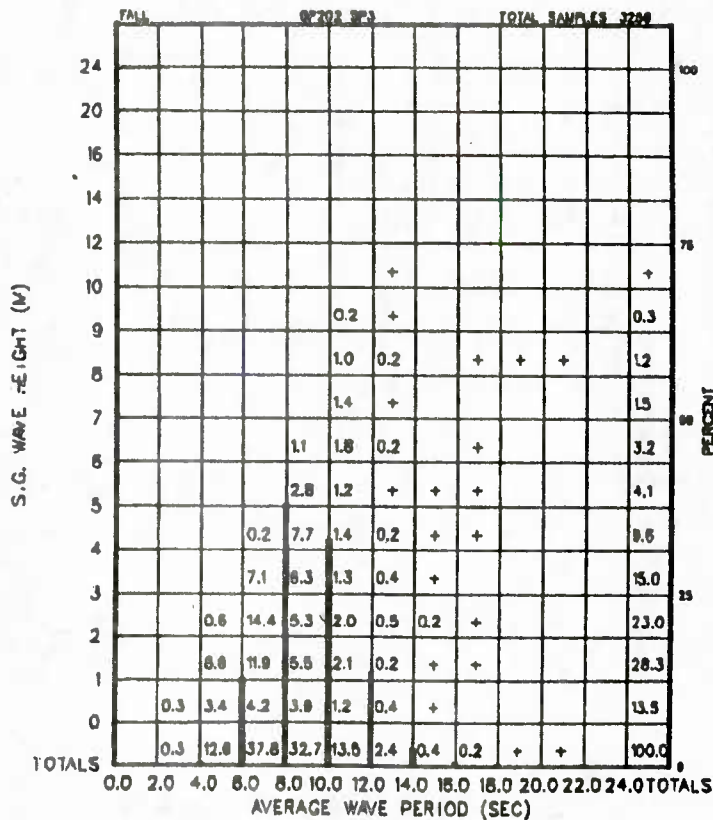


Figure A-202-5-7 Significant Wave Height vs. Average Wave Period

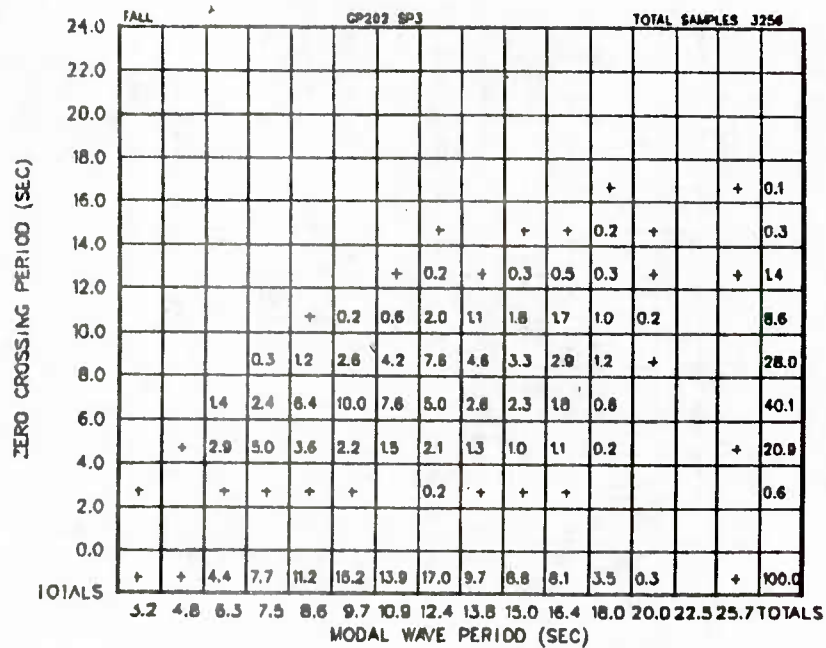


Figure A-202-5-8 Zero Crossing Period vs. Modal Wave Period



TABLE A-4/121-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 24.25°N, 116.34°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 5 -	1.25 8 -	2.5 16 -	1.25 9 -	0.5 7.5 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	10 1 -	19 2 -	10.75 1 -	14 1.5 N
Visibility, nautical miles	10	22	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0 0	3 2	7.5 7	- -	- -
Precipitation (Occurrence)	All precipitation - 1% of the time				
Relative Humidity, %	62	77	92	-	-
Air Temperature, °C	23	25.5	29	26	-
Sea Surface Temperature, °C	26	28	29.5	-	-
Sea Level Pressure, millibars	1010	1014	1017	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	328 - -	- 2% 1%

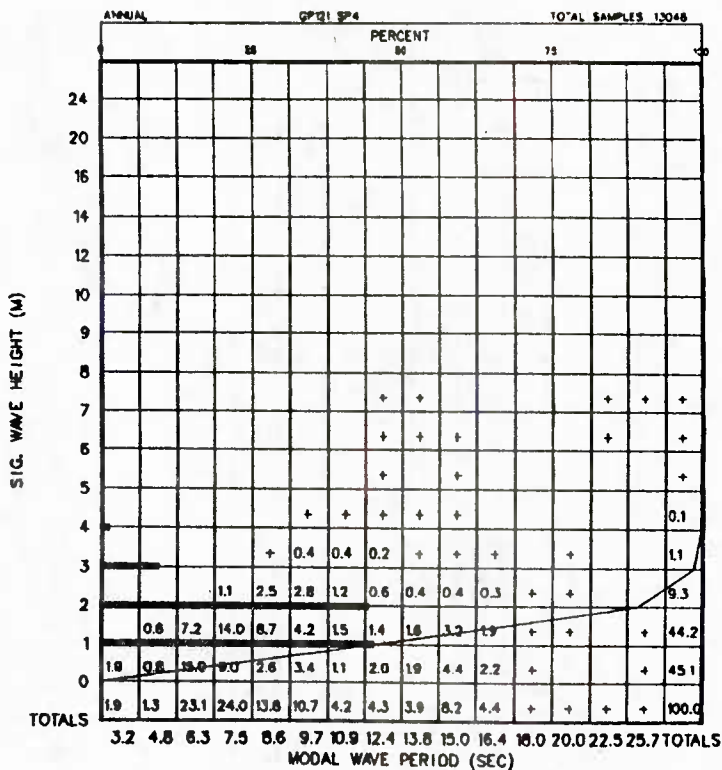


Figure A-4/121-1-1 Significant Wave Height vs. Modal Wave Period

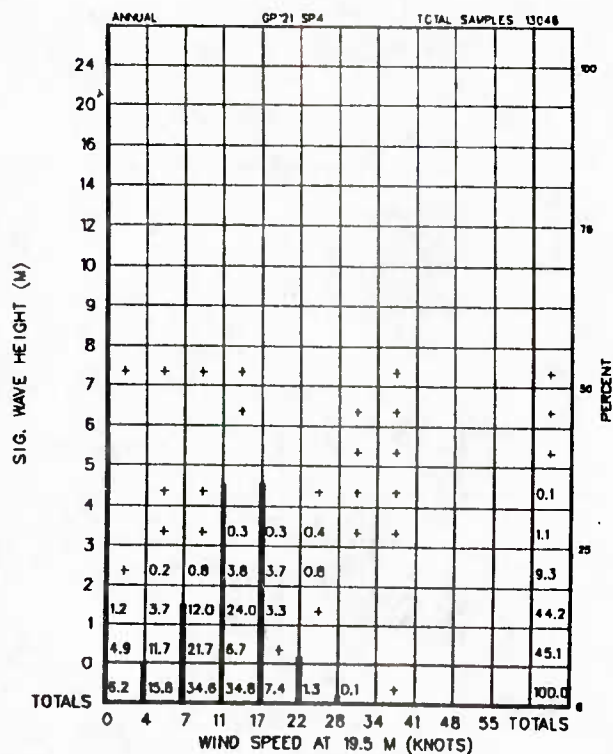


Figure A-4/121-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

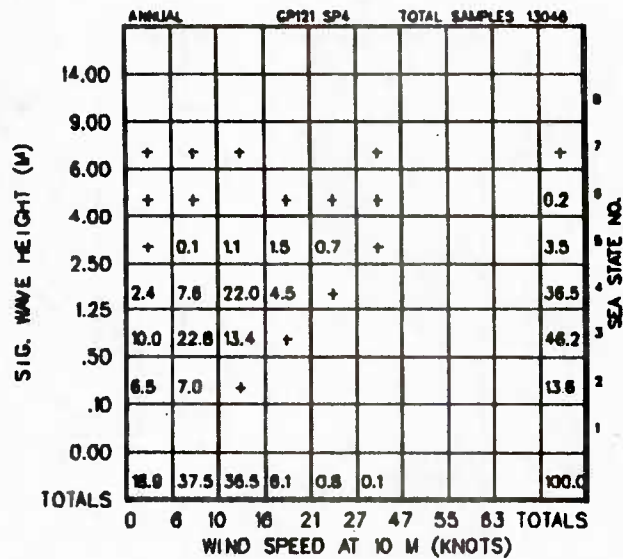


Figure A-4/121-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

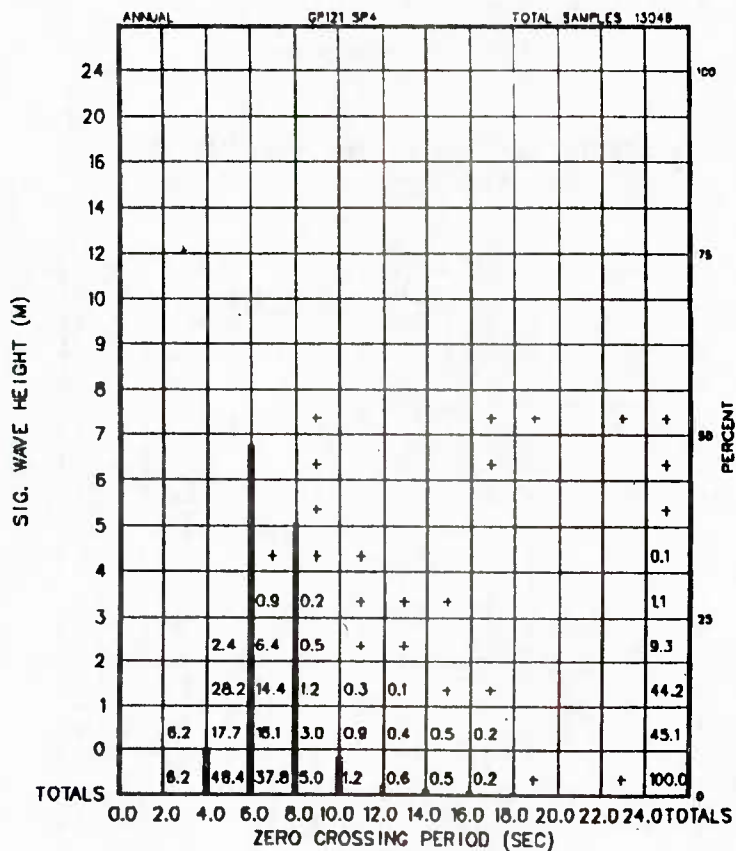


Figure A-4/121-1-6 Significant Wave Height vs. Zero Crossing Period

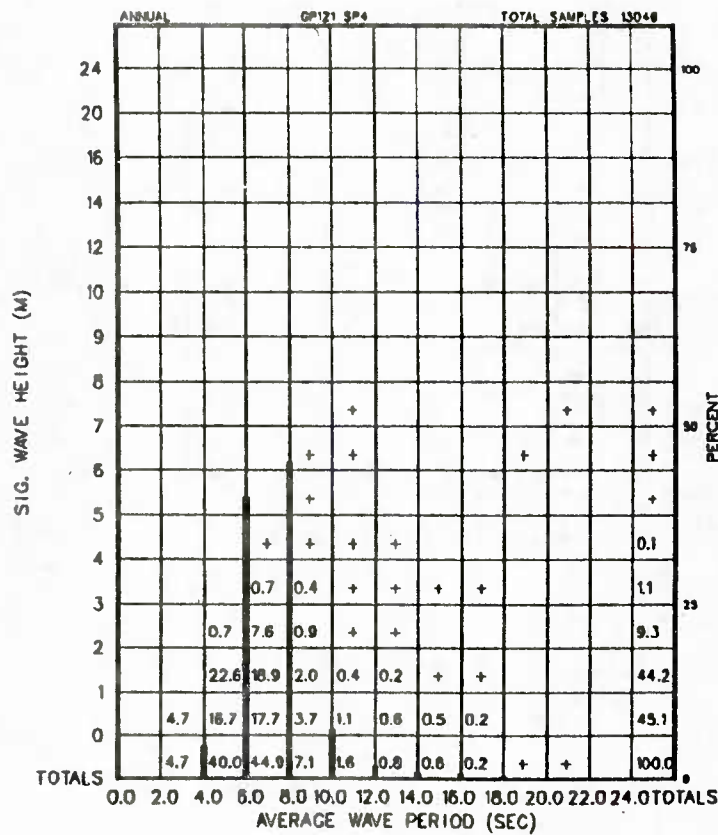


Figure A-4/121-1-7 Significant Wave Height vs. Average Wave Period

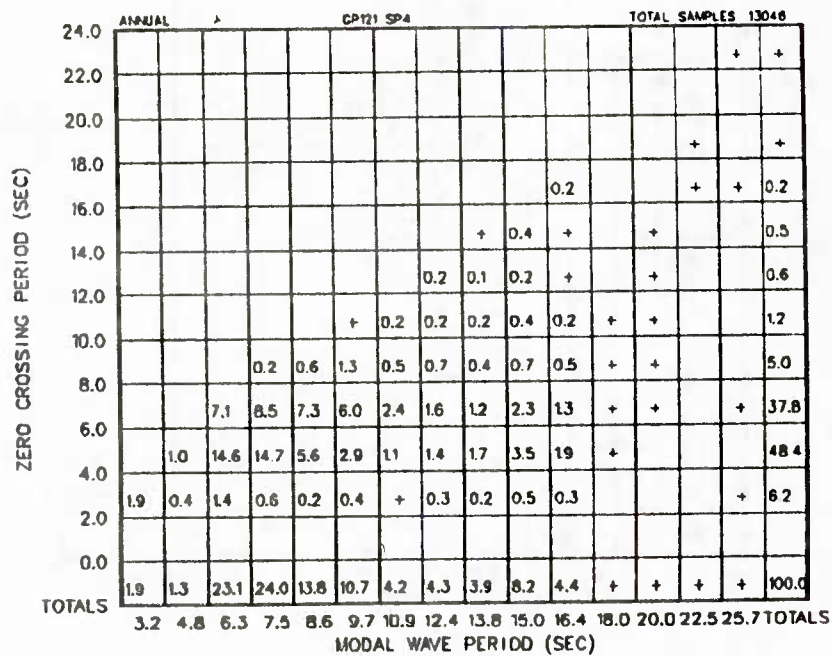
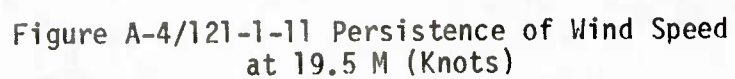


Figure A-4/121-1-8 Zero Crossing Period vs. Modal Wave Period





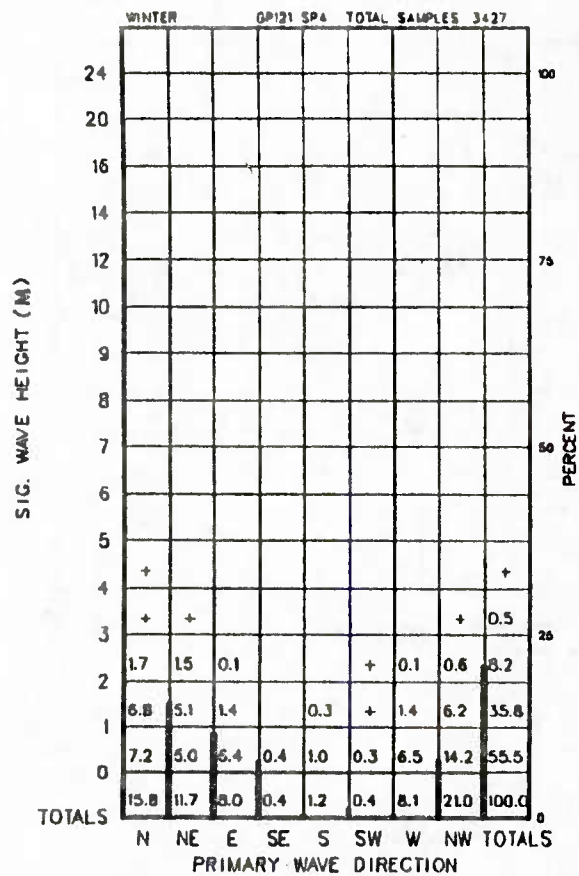


Figure A-4/121-2-3 Significant Wave Height vs. Primary Wave Direction

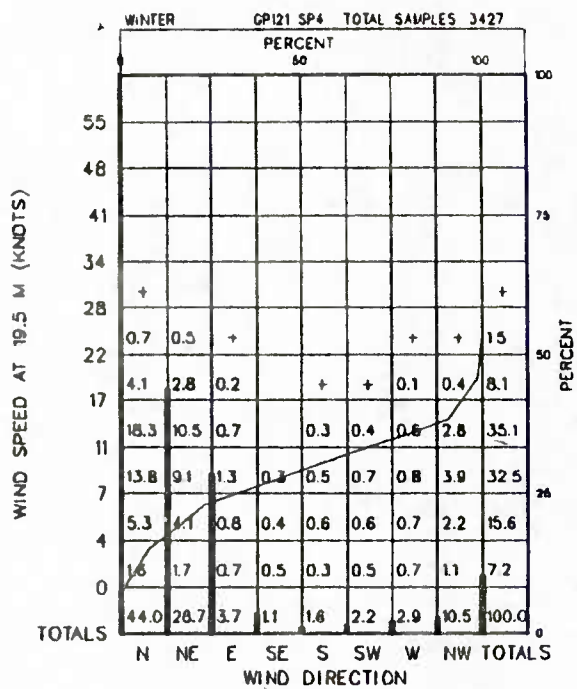


Figure A-4/121-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

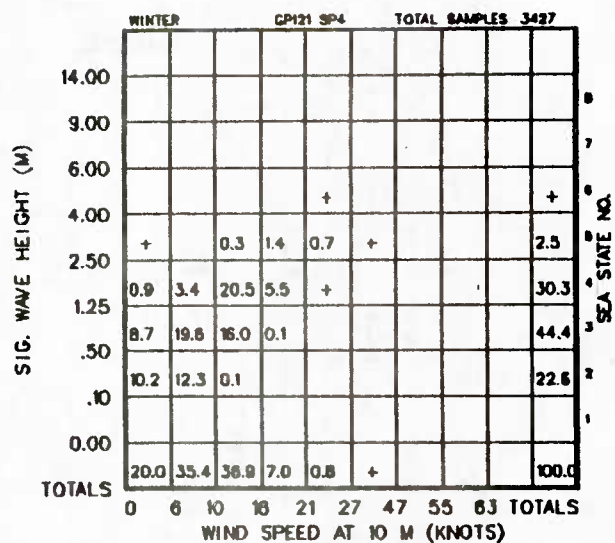


Figure A-4/121-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

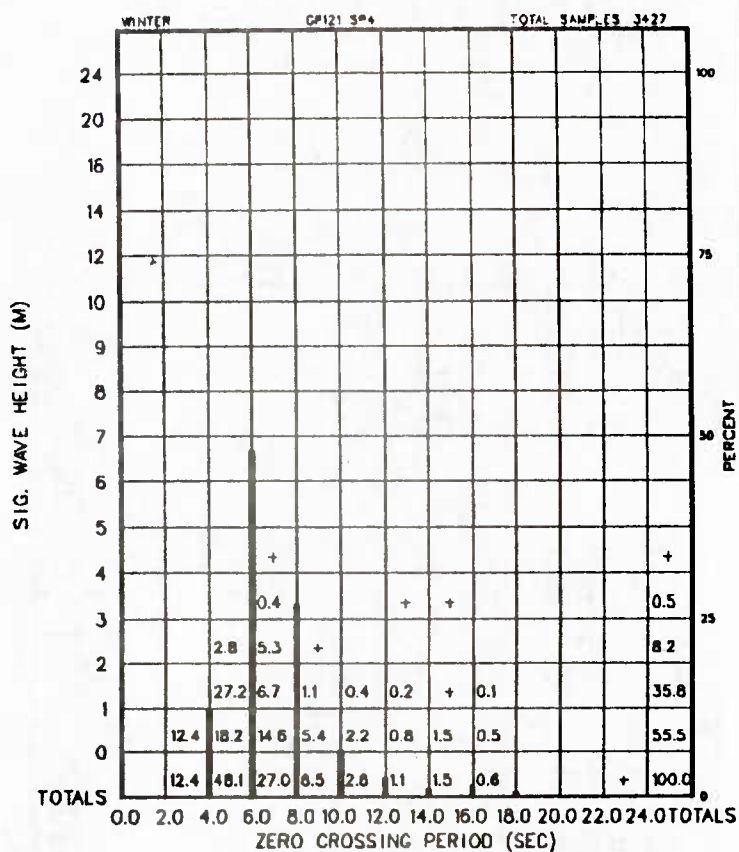


Figure A-4/121-2-6 Significant Wave Height vs. Zero Crossing Period

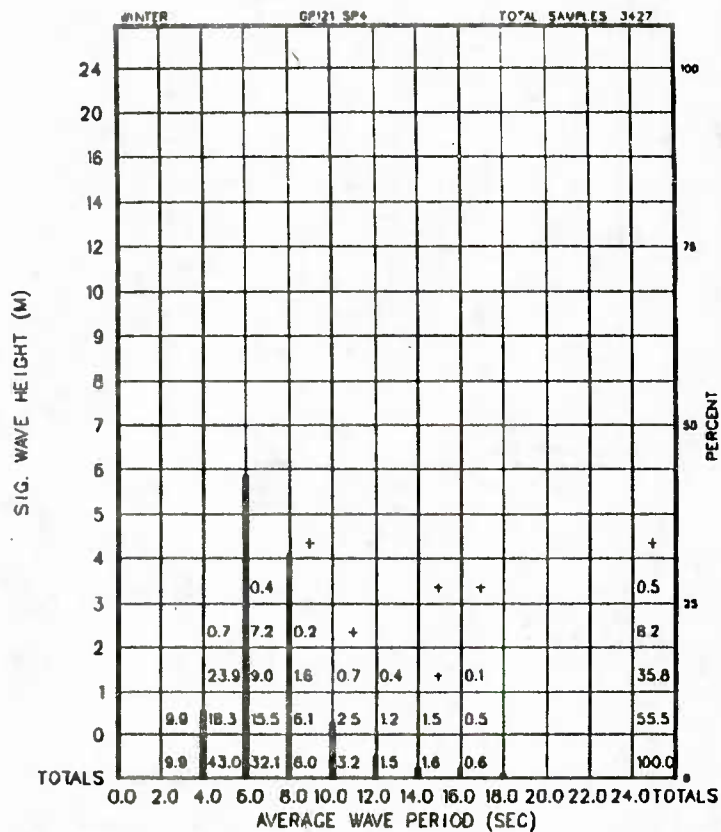


Figure A-4/121-2-7 Significant Wave Height vs. Average Wave Period

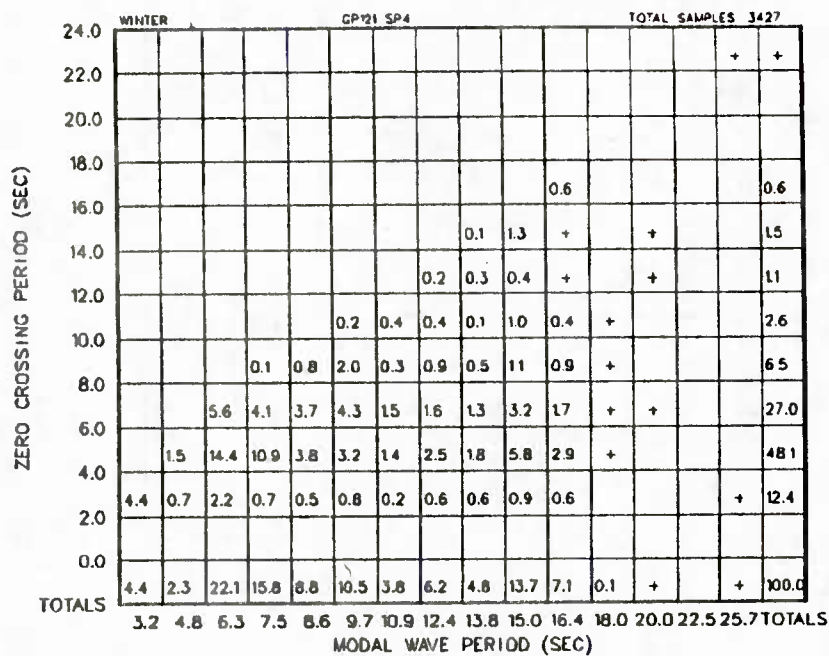


Figure A-4/121-2-8 Zero Crossing Period vs. Modal Wave Period

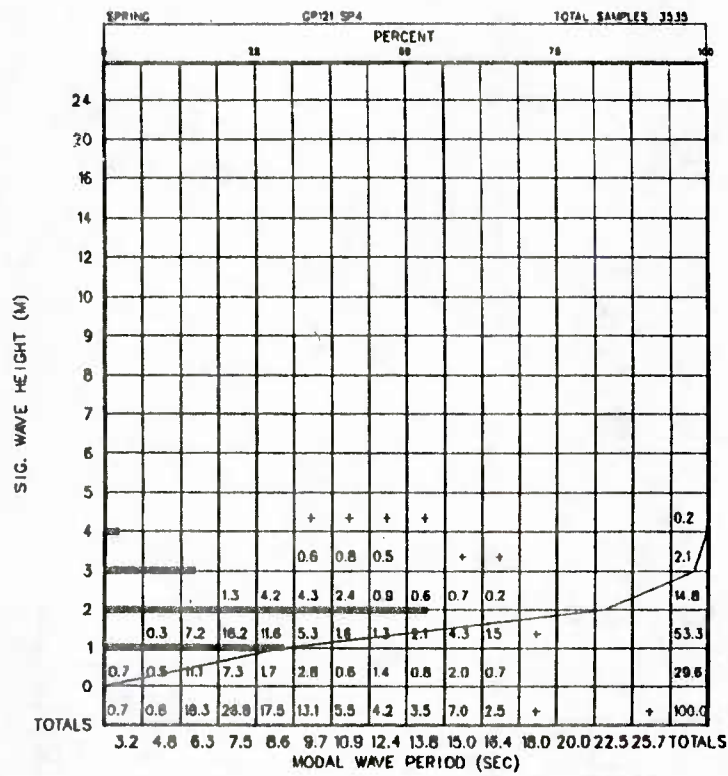


Figure A-4/121-3-1 Significant Wave Height vs. Modal Wave Period

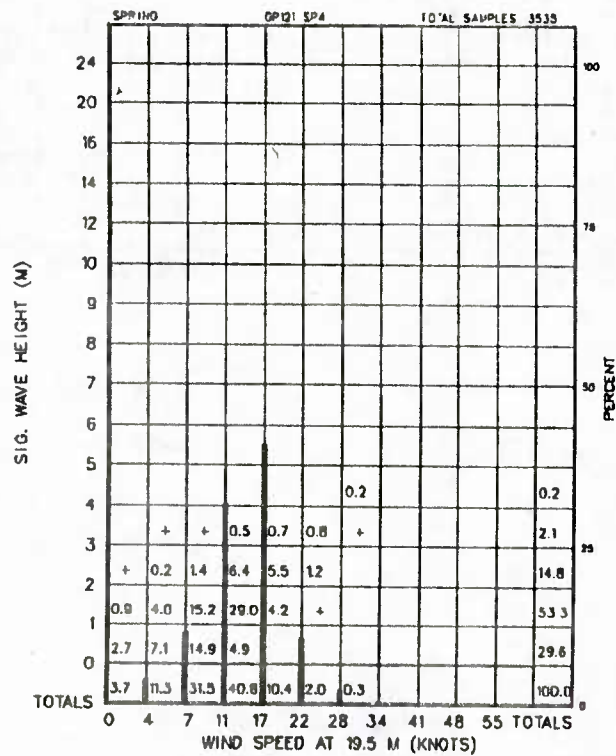


Figure A-4/121-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

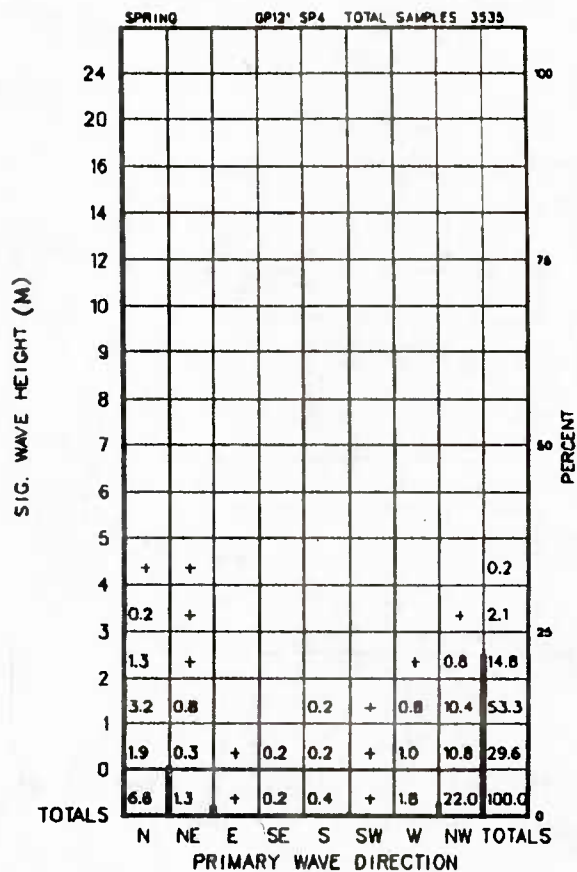


Figure A-4/121-3-3 Significant Wave Height vs. Primary Wave Direction

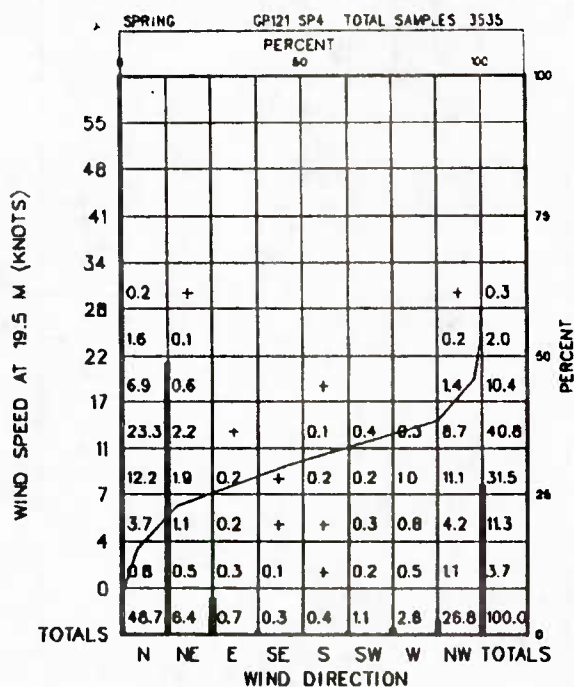


Figure A-4/121-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

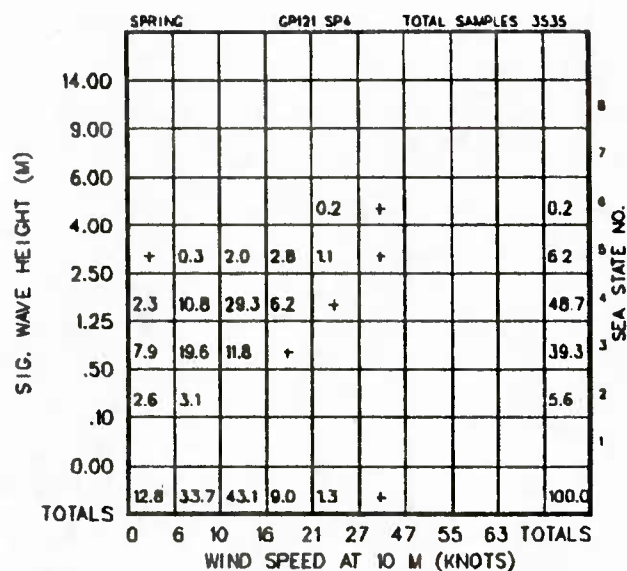


Figure A-4/121-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

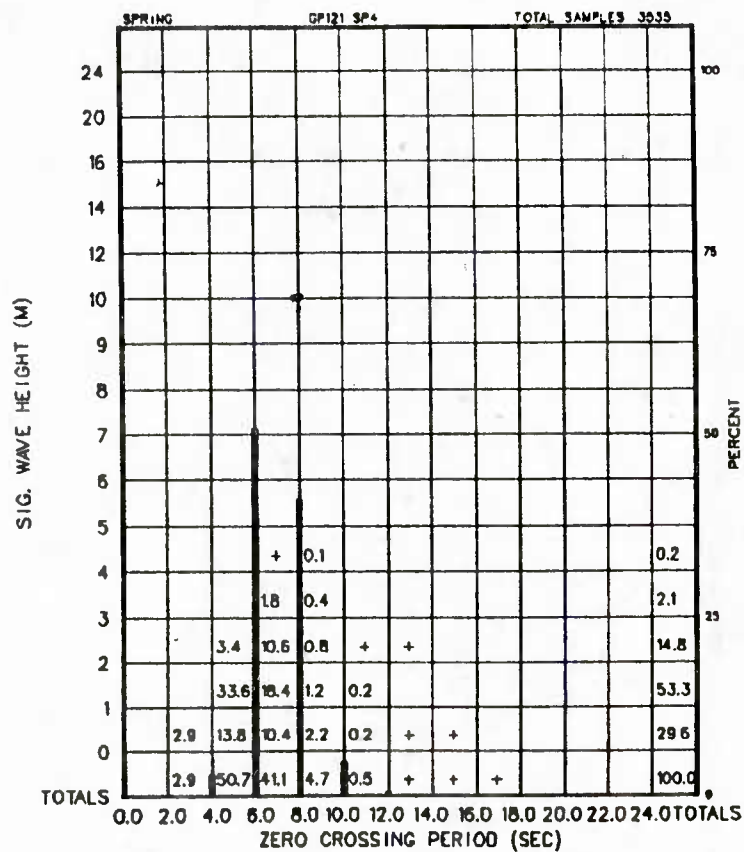


Figure A-4/121-3-6 Significant Wave Height vs. Zero Crossing Period

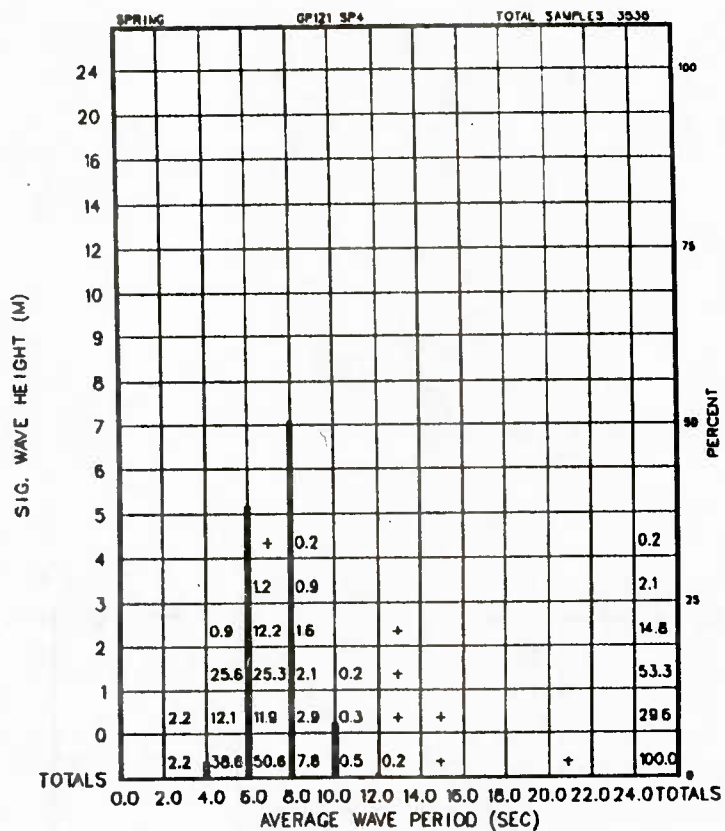


Figure A-4/121-3-7 Significant Wave Height vs. Average Wave Period

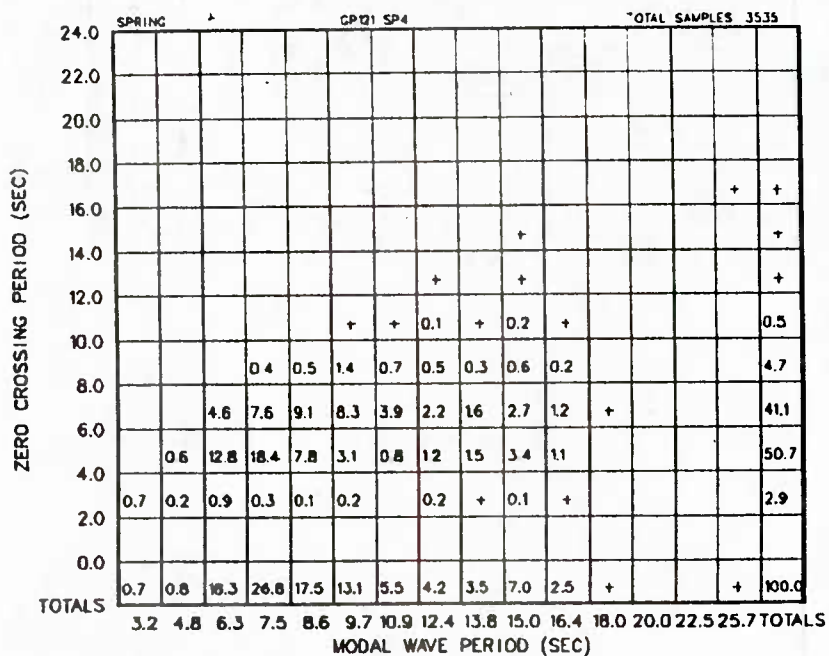


Figure A-4/121-3-8 Zero Crossing Period vs. Modal Wave Period

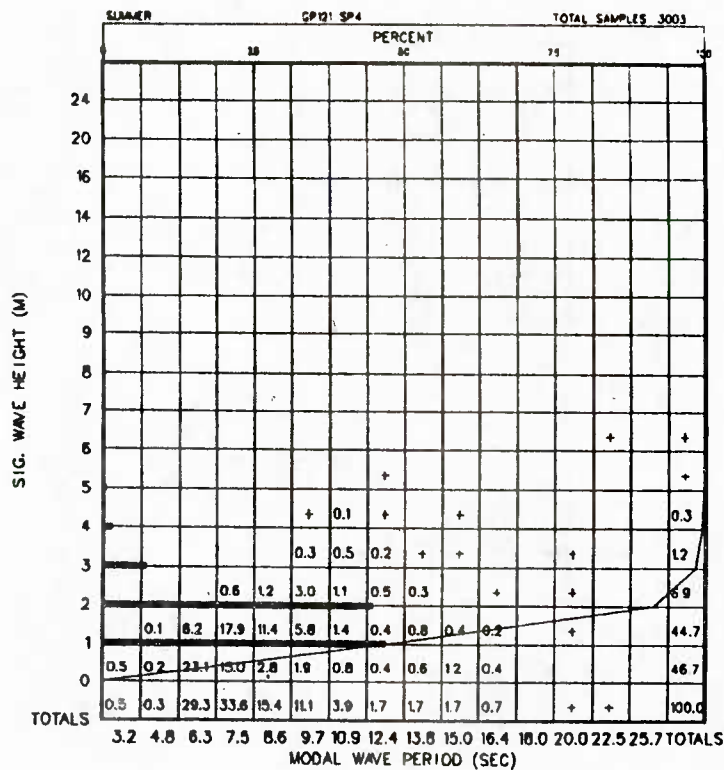


Figure A-4/121-4-1 Significant Wave Height vs. Modal Wave Period

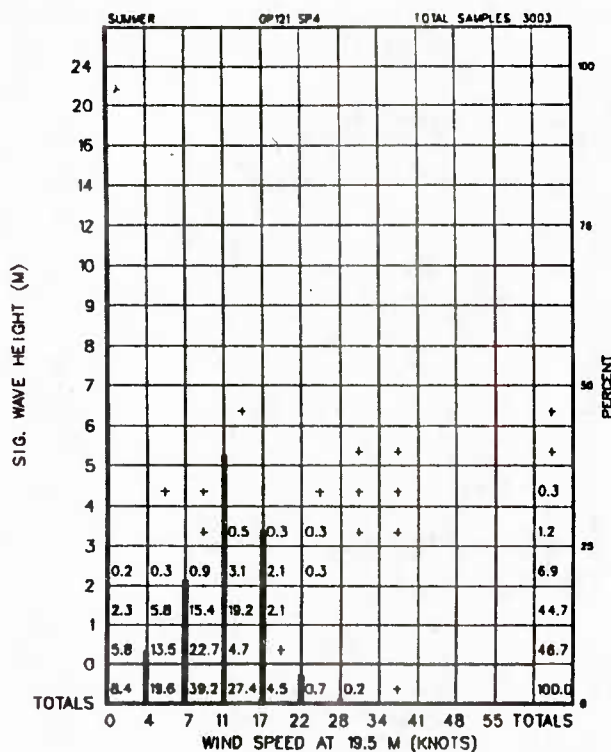


Figure A-4/121-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

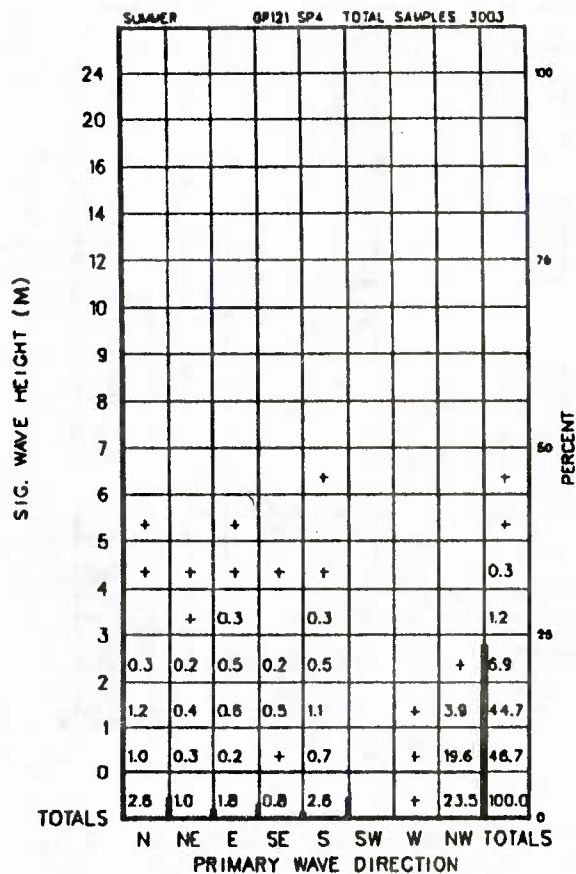


Figure A-4/121-4-3 Significant Wave Height vs. Primary Wave Direction

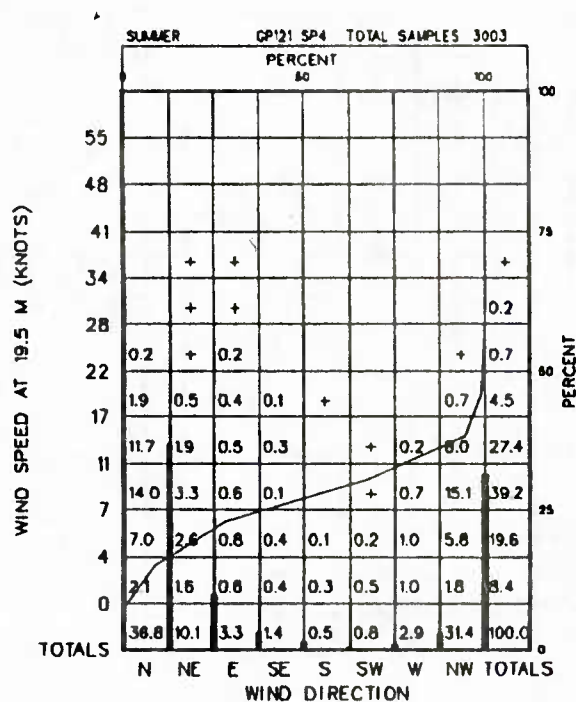


Figure A-4/121-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

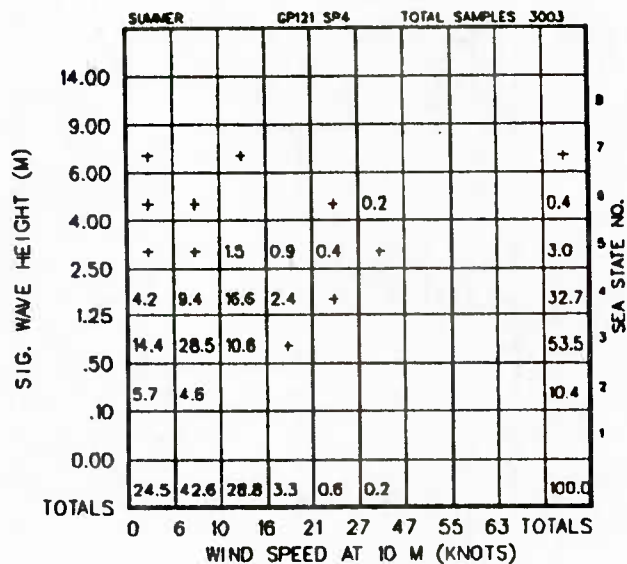


Figure A-4/121-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

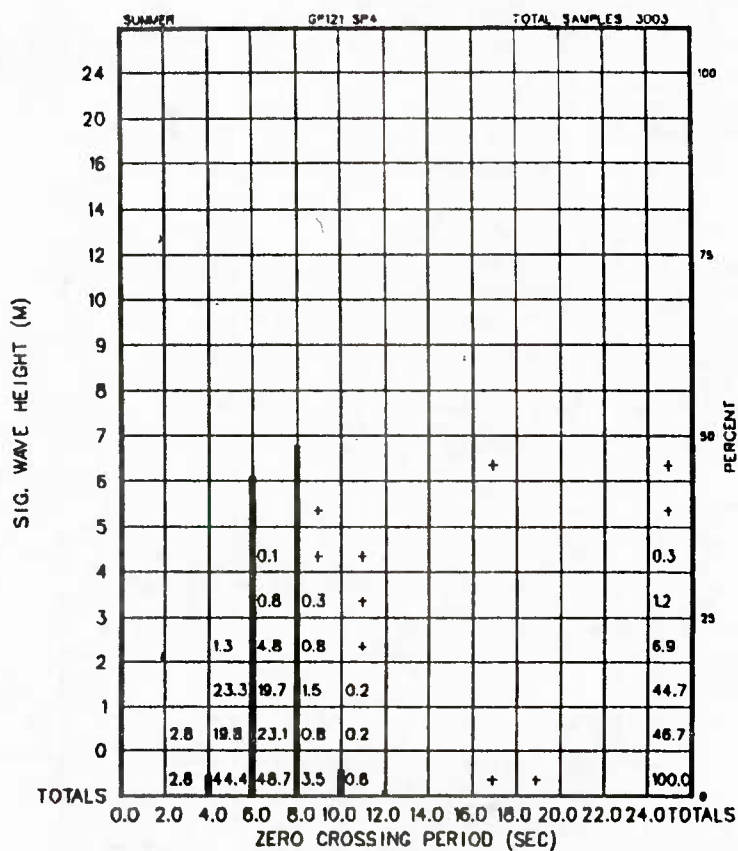


Figure A-4/121-4-6 Significant Wave Height vs. Zero Crossing Period

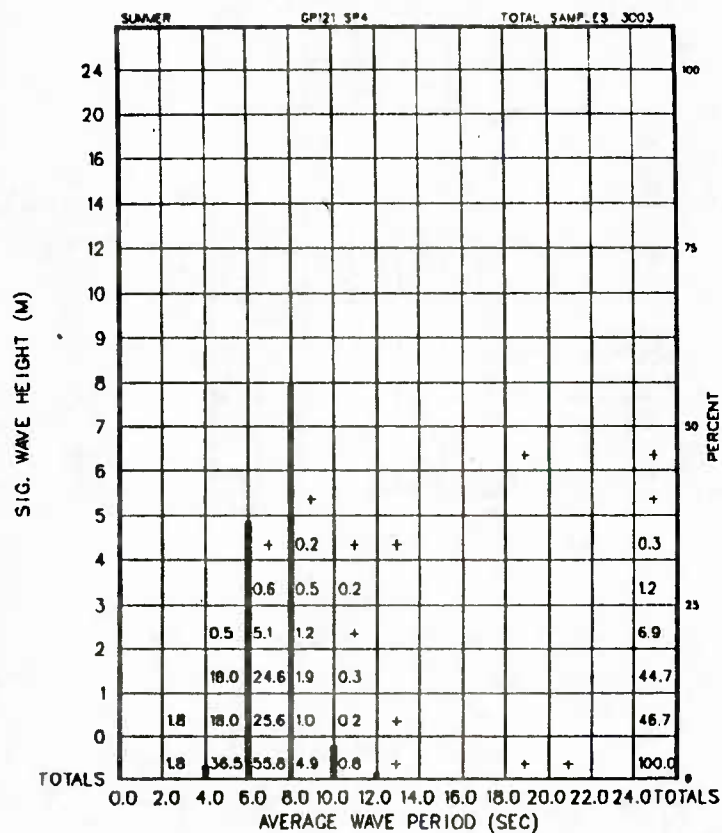


Figure A-4/121-4-7 Significant Wave Height vs. Average Wave Period

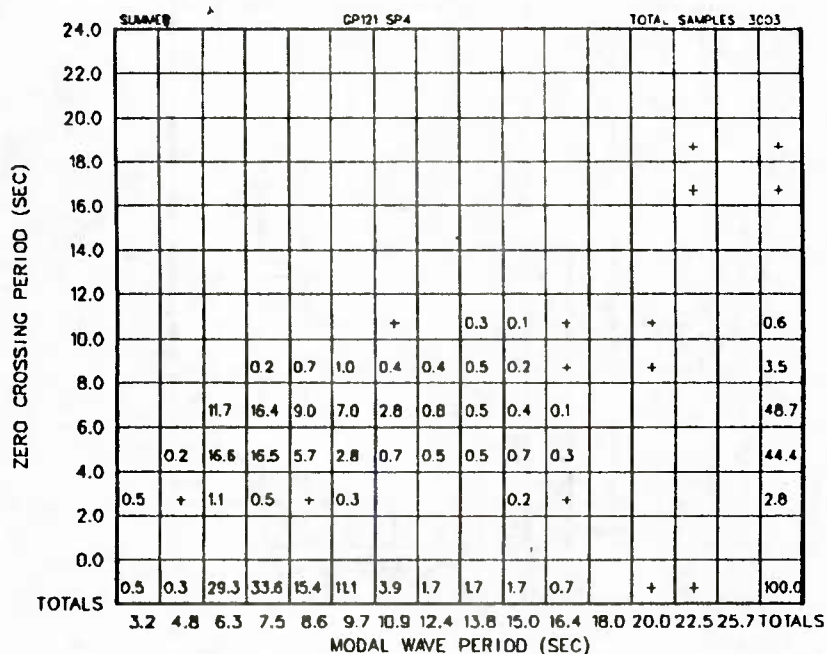


Figure A-4/121-4-8 Zero Crossing Period vs. Modal Wave Period

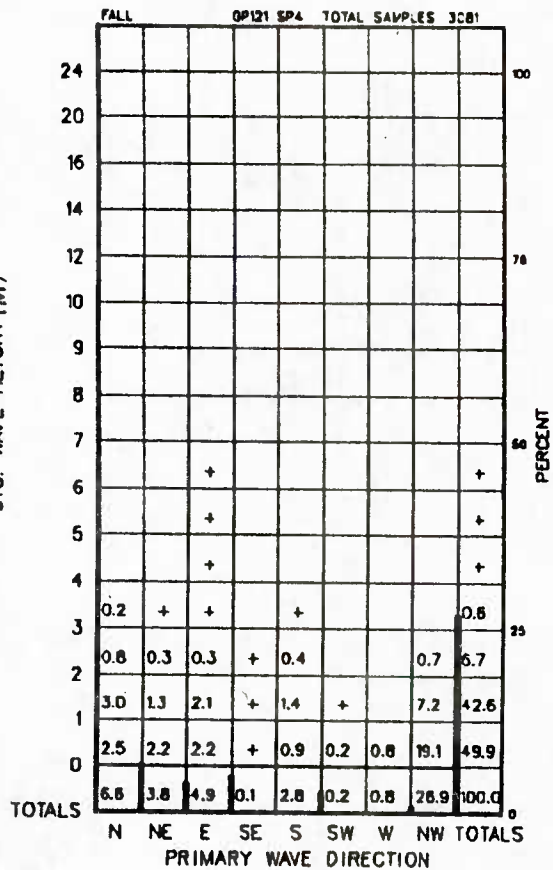


Figure A-4/121-5-3 Significant Wave Height vs. Primary Wave Direction

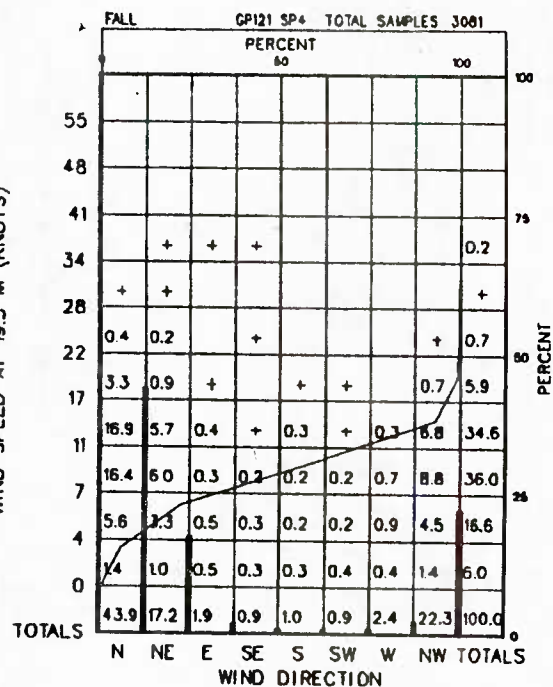


Figure A-4/121-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction



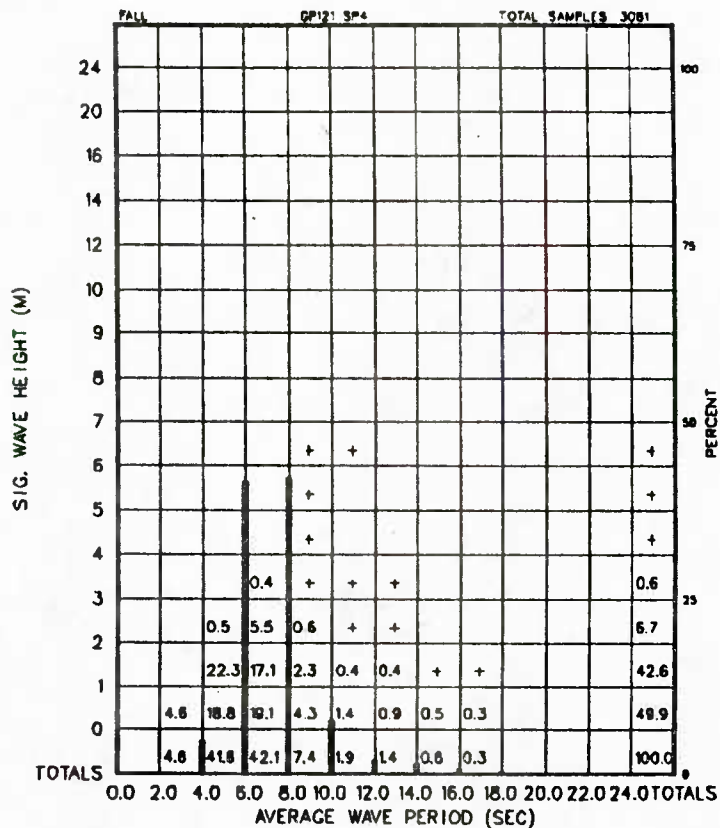


Figure A-4/121-5-7 Significant Wave Height vs. Average Wave Period

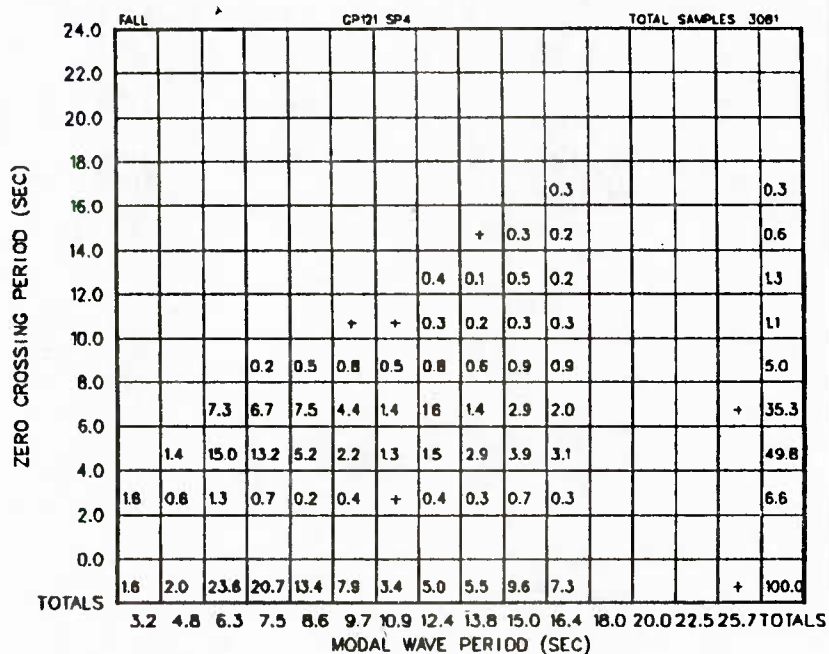


Figure A-4/121-5-8 Zero Crossing Period vs. Modal Wave Period

APPENDIX B

DATA FORMAT DESCRIPTION

APPENDIX B
DATA FORMAT DESCRIPTION

Appendix A contains some of the following natural environment data distributions for each respective geographic location:

- I. Surface Natural Environment Summary
- II. Waves and Wind
 - a. Significant wave height versus modal wave period
 - b. Significant wave height versus wind speed at 19.5 meters
 - c. Significant wave height versus primary wave direction
 - d. Wind speed versus wind direction
 - e. Significant wave height versus wind speed at 10 meters
 - f. Significant wave height versus zero crossing period
 - g. Significant wave height versus average mean period
 - h. Modal wave period versus zero crossing period
 - i. Modal wave period versus average mean period
- III. Persistence
 - j. Persistence of wave height
 - k. Persistence of wind speed

Surface Natural Environment Summary and persistence data are presented for annual season only. Data sets a through k above correspond to data sets 1 through 11, as presented in Figure B-1, respectively.

Each figure in Appendix A is identified by a code as detailed in Figure B-1.

A "standard" format has been adhered to for each environmental parameter at each ocean location. They are described in the following paragraphs and these descriptions should be referred to in interpreting the data presented in Appendix A.

I. SURFACE NATURAL ENVIRONMENT SUMMARY

This table, given for individual ocean or sea areas, summarizes the total natural environment by listing mean, median, most probable, minimum, and maximum values for the various environmental parameters. Ninety-five percent of all natural environment values exceed minimum values, while 5 percent of all natural environment values exceed maximum values. Thus, 90 percent of all values fall within the minimum to maximum value range. The median is the value where above or below lie an equal number of all parameter values. The mean is the average of all values, while the most probable is the one which occurs most often. Together,

these parameters provide an idea of the "shape" of the distribution of occurrences. For example, if the most probable value is less than the mean, the distribution of occurrences is skewed to the lower values. If the most probable value is greater than the mean, the distribution of all occurrences is skewed to the higher values. If the most probable and mean values coincide, the distribution of occurrences may be of the normal type.

II. WAVES AND WIND

Data sets a through i present the percentage frequency of occurrences for various combinations of atmospheric and oceanographic parameters. The number in each square is the percentage frequency of occurrences for that particular combination of parameters indicated at that intersection of the ordinate and abscissa. The right column and bottom row of each graph present the cumulative totals for each respective row and column. As an example, in Figure A-Pac-1-1, the following information can be obtained: (1) 5.8 percent of the data had a combination of 7.5 second modal wave period and 1 to 2 meter significant wave height, (2) 10.6 percent of significant wave heights had modal wave period of 7.5 second, (3) 29.4 percent of all significant wave heights were between 1 and 2 meters, and (4) these events were out of a total of 283,005 samples.

III. PERSISTENCE

Data sets j and k present the persistence or duration of wave height (data set j) and wind speeds (data set k) in terms of occurrences within a range of hours (in 6 hour increments). Again, totals are given in the right column and bottom row. As an example, in Figure A-028-1-10, the following information can be obtained: (1) a significant wave height of 5 to 6 meters persisted for a period greater than 12 hours in 131 cases, (2) a significant wave height of 5 to 6 meters occurred for a total of 634 events, and (3) these events were out of a total of 5561 events.

SAMPLE FIGURE NUMBER

FIGURE

A

-

255

-

1

-

1

DATA SET NUMBER

SEASON

GRID POINT

OCEAN AREA

Ocean	Grid Point	Season	Data Set Number
A-North Pacific	PAC (COMBINED)	1-Combined Annual	1. Height versus Modal Period
		2-Winter	2. Height versus Wind Speed at 19.5 m
		3-Spring	3. Height versus Wave Direction
		4-Summer	4. Wind Speed versus Wind Direction
		5-Fall	5. Height versus Wind Speed at 10 m
	1/239		6. Height versus Zero Crossing Period
	1/255		7. Height versus Mean Period
	1/294		8. Modal Periods versus Zero Crossing period
	2/85		9. Modal Period versus Mean Period
	2/93		10. Persistence of Wave Height
	2/102		11. Persistence of Wind Speed
	2/152		
	2/165		
	2/233		
	3/28		
	3/56		
	3/39		
	3/88		
	3/93		
	3/121		
	3/124		
	3/148		
	3/164		
	3/188		
	3/202		
	4/121		

Figure B-1 - Figure Number Coding System

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